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ABSTRACT

A study was conducted to assess the relationship between data processing competencies taught in Wisconsin Vocational, Technical, and Adult Education District Data Processing programs and on-the-job demands, as a basis for curriculum review and revision. A sample of program graduates, their employers, and instructors were asked to rate 75 competencies in terms of frequency, importance, performance ability, and future need relative to on-the-job requirements. A total of 152 graduates, 80 employers, and 15 instructors provided data for analysis. Results showed a high degree of agreement between graduates, instructors, and employers in regard to the importance, frequency, performance, and future need of the various competencies. Reading memory dumps, working with systems analysts, preparing program documentation manuals, and writing computer operator instructions were suggested as areas needing more program emphasis. Data communications routines, work with users on problems, using company system standards, and structured programming techniques were felt to be increasing importance for the future. Respondents rated knowledge of programming and COBOL as the two most important skill areas for entry-level positions. Overall, it was concluded that the Data Processing program was basically well-structured and well-taught. The survey instruments and list of ranked competencies are appended. (JDS)

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ED134250

Final Report
Project No. 06-161-151-226

RESEARCH OF CURRICULUM CONTENT

DATA PROCESSING PROGRAM

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Table of Contents

	Page
Acknowledgements	i
Table of Contents	ii
List of Tables	iii
Foreword	v
I. Introduction	1
II. Methodology	3
III. Graduate Response - Research Findings and Analysis	6
IV. Employer Response - Research Findings and Analysis	18
V. Instructor Response - Research Findings and Analysis	30
VI. Summary of Survey Responses	40
VII. Interviews	44
VIII. Conclusions and Recommendations	46

Appendix

A - Survey Cover Letters
B - Survey Instrument
C - Interview Procedure and Tabulation
D - Competency Ranks
E - Rank Correlations

List of Tables

Table		Page
1	Graduate Response	3
2	Employer and Instructor Response	4
3	Graduate Competency Ranks	6
4	Data Processing Graduates - Competencies Showing a Difference in Rank of 15 or More Between Importance and Frequency	12
5	Data Processing Graduates - Competencies Showing a Difference in Rank of 15 or More Between Importance and Performance	13
6	Data Processing Graduates - Competencies Showing a Difference in Rank of 15 or More Between Importance and Future Need	14
7	Data Processing Graduates - Rank Correlations	16
8	Data Processing Graduates - General Education and Learning Experiences	16
9	Data Processing Employers Competency Ranks	18
10	Data Processing Employers - Competencies Showing a Difference in Rank of 15 or More Between Importance and Frequency	23
11	Data Processing Employer - Competencies Showing a Difference in Rank of 15 or More Between Importance and Performance	25
12	Data Processing Employers - Competencies Showing a Difference in Rank of 15 or More Between Importance and Future Need	27
13	Data Processing Employers - Rank Correlations	29
14	Data Processing Instructors Competency Ranks	30
15	Data Processing Instructors - Competencies Showing a Difference in Rank of 15 or More Between Importance and Frequency	35

List of Tables (Cont.)

Table		Page
16	Data Processing Instructors - Competencies Showing a Difference in Rank of 15 or More Between Importance and Performance	37
17	Data Processing Instructors - Competencies Showing a Difference in Rank of 15 or More Between Importance and Future Need	38
18	Data Processing Instructor - Rank Correlations	39
19	Importance-Ten Highest and Lowest Ranked Competencies	40
20	Frequency-Ten Highest and Lowest Ranked Competencies	41
21	Performance-Ten Highest and Lowest Ranked Competencies	41
22	Future Need-Ten Highest and Lowest Ranked Competencies	42
23	Rank Correlations Between Importance, Frequency, Performance and Future Need	43
24	Rank Correlations Between Graduates, Employers and Instructors	43

FOREWORD

This study was conducted with the hope that the information obtained could be applied throughout the State of Wisconsin to help the various Vocational, Technical and Adult Education Districts upgrade their data processing programs. The need to keep our programs in time with the changing technology in the data processing field is being felt by everyone concerned with the training of technicians employed in these areas.

In general, it is constructive to look at what we are doing for our graduates and the people that employ them. This survey attempts to get the feelings of these groups and tries to draw some conclusions from the opinions these groups have of our present curricula and what they feel should be updated and revised in our programs.

In order to evaluate the effectiveness of the existing technical programs, a special concern was given to compile and compare the required skills of the employers and the acquired skills of the employees.

This survey made no attempt to determine the degree of competency of the data processing employee in performing the tasks or the need for upgrading his skills. It does indicate those competencies which he performs in addition to those subjects in which he would like further training.

CHAPTER I

INTRODUCTION

Data Processing is a dynamic discipline within the Wisconsin Vocational, Technical and Adult Education system. The rapidly expanding needs of the Data Processing industry make it imperative that both instructors and administrators are continually aware of business and industry's needs in the viable job market where data processing students seek employment. One of the most important components of effective teaching is the adequacy of the curriculum to insure that what is being taught meets the requirements of the employer and the graduates.

Problem

The problem dealt with by this study is fundamentally a problem of communication. The major line of communication between instructors and employers is the state and district data processing advisory committees, which provide a constant source of evaluating and updating curriculum. However, these committees do not encompass the majority of business and industry. Because of the limitations of the advisory committee evaluation with reference to time and experience, there is a need for a structured source of curriculum review to determine what skills are being demanded in the data processing job market.

Within the past five years there has not been, in the Wisconsin Vocational, Technical and Adult Education system, any research conducted to determine the adequacy of the data processing curriculum in meeting the occupational requirements of employers. Because of the dynamics of the data processing field, there is a concern that school curriculums will not keep pace with industry demands and thus lead to complacency and/or eventual training for obsolescence. Without on-going communication from graduates and their employers, the data processing curriculum cannot be kept relevant with the needs of industry.

Objective

The primary objective of this project is to assess the effect of competencies taught in Wisconsin Vocational, Technical and Adult Education Districts with on-the-job demands. Through an

evaluation of these competencies, conclusions may be reached which will lead to recommendations for improvement or updating of the Associate Degree Data Processing programs presently offered through the Wisconsin Vocational, Technical and Adult Education system.

The specific objectives of the study include the following:

1. To interview a sample of former students of the Data Processing programs throughout the State of Wisconsin and their respective employers to determine the strengths and weaknesses of the present program.

2. To survey a larger sample of former students and employers, via a mail questionnaire, to determine the strengths and weaknesses of the present program.

3. To survey the instructors in the Data Processing programs to obtain their input as to how the program may be improved.

4. To interpret the results of these interviews and surveys to reach conclusions and give direction for improvement of the Data Processing program.

CHAPTER II

METHODOLOGY

During the early stages of development of this study, it was discovered that District One Technical Institute-Eau Claire was developing a similar survey with the objective of determining job entry skills. It was felt that since these two projects would be surveying the same population and using basically the same type of survey instrument, cooperation in gathering data would be of benefit to both institutions.

The survey instrument developed by District One Technical Institute was reviewed by the instructors and advisory committee members of Gateway Technical Institute's Data Processing Associate Degree program. It was felt that District One's survey instrument, with the addition of several general education competencies, would meet the objectives of this study.

A mailing list was obtained from the Wisconsin Vocational, Technical and Adult Education Districts offering the Data Processing Associate Degree program of the 1973, 1974 and 1975 graduates. Each graduate was mailed a packet consisting of a cover letter, survey instrument and return envelope. Also included was a similar packet which was to be given to the graduate's supervisor. Copies of the cover letters are in Appendix A. The first mailing was sent February 17, 1976 with a follow-up mailing on March 3, 1976. Data Processing instructors were also sent the survey instrument with the first mailing on March 31, 1976 and a follow-up mailing April 13, 1976. Tables 1 and 2 give a breakdown of the survey response. Although a higher return rate was desired, it was determined that the number of responses was great enough to draw valid conclusions.

Table 1

Graduate Response

	Total Graduates	Total Response	Percent Response
District One	40	15	37.5%
Western Wisconsin	52	8	15.4
Madison Area	83	22	26.5
Gateway	74	26	35.1
Waukesha Co.	15	6	40.0
Milwaukee Area	98	24	24.5
Fox Valley	49	14	28.6
Northeast Wisconsin	36	19	52.8
North Central	55	18	32.7
TOTALS	502	152	30.3%

Table 2

Employer and Instructor Response

	Total Employer Response	Total Instructor Response
District One	10	2
Western Wisconsin	3	1
Madison Area	15	1
Gateway	11	3
Waukesha Co.	3	2
Milwaukee Area	12	2
Fox Valley	6	1
Northeast Wisconsin	11	2
North Central	9	1
TOTALS	80	15

The survey instrument consisted of a listing of 75 competencies on which respondents were requested to react on a Likert type scale ranging from one to five on the four areas of: Frequency, Performance, Importance and Future Need which are defined as follows:

Frequency--how often a competency is performed on the job.
Performance--the ability of the employee in doing this competency on the job.
Importance--the critical need of a competency on the job.
Future Need--the anticipated importance of a competency on the job.

In addition to this, eleven general education learning experiences were listed on which graduates were asked to react regarding the amount of emphasis which should be placed on these areas. Copies of the survey instrument are in Appendix B.

Respondents were asked on the survey instrument if they would be available for a follow-up interview. Interviews were then conducted of graduates and their supervisors. A total of 31 graduates and 32 employers were interviewed. The interview guide may be found in Appendix C.

When the data had been collected, it was tabulated, analyzed and reviewed for purposes of evaluation. Statistical tabulations consisted of computing a mean and standard deviation for each competency, which was then ranked according to mean.

Correlations were calculated between areas of evaluation, e.g., Frequency, Performance, Importance and Future Need; and between groups of respondents, e.g., graduates, employers and instructors. This was done by using Spearmen's Rank Correlation Coefficient, adjusting for tied ranks.[1] All correlations were tested at the .01 level of significance. This test provides assurance that those correlations meeting this level of significance show true agreement and are not chance correlations. Tabulation of the interview response consisted of simple descriptive statistics. Conclusions and recommendations were developed through a review of this data.

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[1]N. M. Downie and R. W. Heath, Basic Statistical Methods, (New York: Harper and Row, 1965), P. 207

CHAPTER III

GRADUATE RESPONSE

RESEARCH FINDINGS AND ANALYSIS

The survey instrument consists of a competency list of 75 items on which Data Processing Associate Degree graduates were asked to react on four areas: Frequency, Performance, Importance and Future Need. In addition, graduates were asked to indicate the amount of emphasis required in eleven general education areas. Table 3 shows a comparison of ranks between competencies. A complete presentation of data, including means and standard deviation may be found in Appendix D.

Table 3

Graduate Competency Ranks

N = 152

Competency	Importance	Frequency	Performance	Future Need
Correct logical errors	1	6	4	2
Read a program listing	2	1	1	1
Correct syntax (clerical errors	3	2	3	18.5
Desk check a program	4	4	5	3
Use job control language (Control Cards)	5	5	6	4
Test program using test data	6	10	9	5
Write higher level language instructions	7	13	12	9
Use coding sheets	8	3	2	33
Test program using live (user) data	9	16	14	15.5
Perform program maintenance	10	11	17	12

Table 3

Graduate Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Prepare a test data for programs	11	18	20	10
Work with other programmers on problem	12	8	19	15.5
Write computer operator instructions	13	32	30	7
Read a file dump	14	15	18	23
Write comments in program	15	12	7	8
Write edit routines	16	21	21	18.5
Write error routines	17	17	13	18.5
Read a cross-reference listing	18	14	8	27
Write sequential disk file handling routines	19	20	15	32
Read a memory dump	20	30	48	28
Work with systems analyst on problem	21	19	44	26
Use index-sequential disk file handling routines	22.5	33	34	30.5
Patch computer programs	22.5	22	37	36
Write documentation updates after a program revision	24	36	38	13
Select appropriate data names for data	25	9	10	34
Use tape file handling routines	26	28	23	41

Table 3

Graduate Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Use library routines	27	27	27	22
Use disk sort utility routines	28	23	11	24
Write subroutines	29	39	33	25
Work with users on problem	30	38	52	11
Use random disk file handling routines	31	43	45	30.5
Prepare a program documentation manual	32	48	51	18.5
Prepare a disk record layout	33	45	26	35
Write instructions for internal/external controls	34	42	40	40
Write table searching instructions	35	29	28	37
Use data communications routines	36	59	60	14
Use structured programming techniques	37	26	35	6
Use card file handling routines	38	24	16	61.5
Write table building instructions	39	31	29	38
Select file organization & access methods for data files	40	46	56	40
Prepare a printer spacing form	41	34	22	43.5

Table 3

Graduate Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Use company system standards	42	7	46	21
Prepare a general (logic) program flowchart	43	35	24	39
Recommend corrections or modifications to programs	44	40	50	29
Perform number system arithmetic	45	41	39	55
Prepare a tape record layout	46	60	36	52
Select appropriate programming language for problem	47	68	47	67
Summarize the controls in program to detect errors	48	54	54	47
Edit program for effective use of auxiliary storage	49	62	59	49
Use standard flowchart symbols	50	25	25	50
Use tape sort utility routines	51	56	42	58
Read a trace	52	58	55	57
Prepare a card record layout	53	50	31	59
Operate computer for program tests	54	37	41	65
Divide a program into modules	55	57	62	45

Table 3

Graduate Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Summarize calculations used in program	56	61	53	51
Prepare a detail program flowchart	57	49	32	54
Convert numbers between number systems	58	47	43	61.5
Use virtual storage techniques	59	53	64	46
Use macros	60	52	58	56
Write assembler language instructions	61	65	65	66
Write a detailed description of a problem	62	51	69	48
Write table sorting instructions	63	64	61	60
Prepare a system flowchart	64	55	57	43.5
Write library routines	65	67	67	53
Write check digit checking routines	66	66	63	64
Write check point-restart instructions	67	69	70	63
Write report program generator language instructions	68	63	66	69
Write form test pattern routines	69	70	68	68

Table 3

Graduate Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Keypunch program	70	44	49	72
Prepare a decision table	71	71	71	71
Convert a program to another language	72	72	72	70
Prepare printer carriage tape	73	73	73	73
Prepare a grid chart	74	74	74	74
Prepare a paper tape record layout	75	75	75	75

Competencies were ranked according to the Importance of the competency on the job, which was used as the standard of comparison for Frequency, Performance and Future Need. In comparing these areas, a difference in rank of 15 or more was considered to be sufficient variance to deserve attention. General education learning experiences were treated separately.

Table 4 gives those competencies which show a difference in rank of 15 or more between Importance and Frequency. A negative difference in rank indicates that the competency may not be performed frequently, but is ranked relatively high in Importance. A positive difference in rank indiciates that the competency may be ranked relatively low in Importance, but is performed frequently.

Table 4

Data Processing Graduates
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Frequency

Competency	Rank Importance	Rank Frequency	Difference in Rank
Use data communications routines	36	59	-23
Select appropriate programming language for problem	47	68	-21
Write computer operator instructions	13	32	-19
Prepare a program documentation manual	32	48	-16
Select appropriate data names for data	25	9	+16
Operate computer for program tests	54	37	+17
Use standard flowchart symbols	50	25	+25
Keypunch program	70	44	+26
Use company system standards	42	7	+35

The one major area which is revealed by this comparison is "Use company system standards" which is ranked very high in Frequency, and relatively low in Importance. "Keypunch program" and "Use standard flowchart symbols" also show a great difference in rank, indicating that these competencies, although ranked low in Importance are performed frequently. On the other hand, the data indicates that the competencies "Use data communications routines" and "Select appropriate programming language for problem", while not performed frequently are ranked relative high in Importance.

A comparison of ranks between Importance and Performance is given in Table 5 which shows those competencies with a difference in rank of 15 or more. A negative difference indicates that the performance level is ranked lower than importance of the competency, and may indicate an area which should receive more emphasis in training. A positive difference indicates an area which may require less emphasis in training.

Table 5

Data Processing Graduates
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Performance

Competency	Rank Importance	Rank Performance	Difference in Rank
Read a memory dump	20	48	-28
Use data communications routines	36	60	-24
Work with system analyst on problem	21	44	-23
Work with users on problem	30	52	-22
Prepare a program documentation manual	32	51	-19
Write computer operator instructions	13	30	-17
Select file organization and access methods for data files	40	56	-16
Convert numbers between number systems	58	43	+15
Select appropriate data names for data	25	10	+15
Use disk sort utility routines	28	11	+17
Prepare a general (logic) program flowchart	43	24	+19
Prepare a printer spacing form	41	22	+19
Keypunch program	70	49	+21
Prepare a card record layout	53	31	+22
Use card file handling routines	38	16	+22
Prepare a detail program flowchart	57	32	+25
Use standard flowchart symbols	50	25	+25

The competency "Read a memory dump" shows the greatest difference in rank and may indicate a need for further training in this area. Other competencies ranked relatively high in Importance and low in Performance are: "Use data communications routines", "Work with systems analyst on problem" and "Work with users on problem". Two of these competencies directly relate to an ability to communicate with others.

Competencies which are ranked relatively high in Performance and low in Importance are: "Use standard flowchart symbols", and "Prepare a detail program flowchart". These areas may require less emphasis in training.

Importance and Future Need were also compared. In this area a negative difference indicates less need for the competency in the future, while a positive difference indicates that there will be more need for the competency in the future. Table 6 shows those competencies with a difference in rank of 15 or more.

Table 6

Data Processing Graduates
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Future Need

Competency	Rank Importance	Rank Future Need	Difference in Rank
Use coding	8	33	-25
Use card file handling routines routines	38	61.5	-23.5
Select appropriate programming language for problem	47	67	-20
Correct syntax (clerical) errors	3	18.5	-15.5
Use tape file handling routines routines	26	41	-15
Recommend corrections or modifications to programs	44	29	+15
Work with users on problem	30	11	+19
Prepare a system flowchart	64	43.5	+20.5
Use company system standards	42	21	+21
Use data communications routines	36	14	+22
Use structured programming techniques	37	6	+31

Competencies for which there may be reduced need in the future are, "Use coding sheets", "Use card file handling routines" and "Select appropriate programming language for problem". The competency which shows the greatest Future Need is, "Use structured programming techniques". Other competencies showing an increase in Future Need are "Use data communications routines", "Use company system standards" and "Prepare a system flowchart".

A review of the graduate response reveals the following competencies which may require more emphasis. In these areas, both Importance and Future Need are ranked relatively high while Frequency and Performance are ranked low.

Write computer operator instructions
Prepare a program documentation manual
Use data communications routines
Work with users on problem

The following competencies may require less emphasis than they presently receive. These areas show relatively low ranks on Importance and Future Need, and are ranked high on Frequency and Performance.

Select appropriate data names for data
Use card file handling routines
Use standard flowchart symbols
Keypunch program

The two competencies listed below should probably maintain their level of training, The first competency shows a high rank in Performance, however, the indication for a greater Future Need will probably justify this level of training. The second competency shows a low rank in Performance, with a probable decreasing need for this competency.

Use company systems standards
Select appropriate programming language for problem

Rank correlations were computed between areas of response using Spearman's Rank Correlation Coefficient, adjusting for tied ranks. Table 7 gives these correlations.

Table 7

Data Processing Graduates
Rank Correlations

Area of Response	Rank Correlation
Importance/Frequency	0.89
Importance/Performance	0.86
Importance/Future Need	0.90
Performance/Frequency	0.90
Performance/Future Need	0.69
Frequency/Future Need	0.80

All correlations were significant at the .01 level, with the highest correlations being shown between Importance and Future Need and between Performance and Frequency. Importance and Frequency also showed a very high correlation. The lowest correlation was between Performance and Future Need.

General education and learning experiences were treated separately. A mean and standard deviation was computed for each item and items were then ranked according to mean. Table 8 gives the mean, standard deviation and rank for the general education learning experiences.

Table 8

Data Processing Graduates
General Education and Learning Experiences

Competency	Rank	Mean[1] S.D.[2]
Effective speaking (Speech)	1	3.73 0.86
Field Trips	2	3.56 0.95
Communications Skills (English)	3	3.48 0.89

[1]Some items may appear to have the same mean and different ranks due to rounding the mean to two decimal places after ranking.

[2]S.D. = Standard Deviation. A low standard deviation indicates a high degree of consistency in response.

Table 8

Data Processing Graduates
General Education and Learning Experiences

(Cont.)

Competency	Rank	Mean S.D.
Statistics	4	3.47 0.85
Office Management	5	3.47 0.96
Psychology of Human Relations	6	3.36 0.95
Accounting	7	3.34 0.88
State Competitive Data Processing Exams	8	3.26 0.10
Student Data Processing Clubs	9	3.26 0.84
Economics	10	2.96 0.75
American Institutions (Government)	11	2.44 0.77

Communication skills, both written and oral are ranked very high by respondents. Field trips also rank high along with Statistics and Office Management.

CHAPTER IV

EMPLOYER RESPONSE

RESEARCH FINDINGS AND ANALYSIS

Employers were requested to complete the same survey instrument which was mailed to graduates. Again, this consisted of a listing of 75 competencies on which employers of Data Processing Associate Degree graduates were asked to react on four areas: Frequency, Performance, Importance, Future Need. Competencies were ranked according to the importance of the competency on the job. This was then used as the standard of comparison for Frequency, Performance and Future Need. Table 9 shows the comparison of ranks between competencies. The complete data, including means and standard deviations, may be found in Appendix D.

Table 9

Data Processing Employers Competency Ranks
N = 80

Competency	Importance	Frequency	Performance	Future Need
Read a program listing	1	1	2	6
Desk check a program	2	2	5	2
Correct logical errors	3	5	7	3
Corect syntax (clerical) errors	4	4	3	19
Test program using test data	5	7	4	7
Test program using live (user) data	6	15	15	12
Write higher level language instructions	7	12	11	5
Use coding sheets	8	3	1	39
Prepare a test data for programs	9	13	18	1
Use job control language (Control Cards)	10	6	6	18

Table 9

Data Processing Employers Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Write comments in program	11	8	13	9.5
Perform program maintenance	12	10	14	16
Work with other programmers on problem	13	9	8	9.5
Read a file dump	14	14	21	26
Write computer operator instructions	15	24.5	38	17
Write edit routines	16	17	20	22
Write error routines	17	21.5	25	23.5
Work with systems analyst on problem	18	11	41	11
Prepare a disk record layout	19	44	34	29
Write documentation updates after a program revision	20	27	43	15
Write sequential disk file handling routines	21.5	24.5	10	36
Use index-sequential disk file handling routines	21.5	28	27	30
Prepare a program documentation manual	23	42	48.5	13
Prepare a general (logic) program flowchart	24	34	37	44
Write table searching instructions	25	30	26	31

Table 9

Data Processing Employers Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Read a cross-reference listing	26	20	9	43
Use library routines	27	21.5	24	27
Select file organization & access methods for data files	28	55	56	32
Write subroutines	29	36	39	21
Use structured programming techniques	30	40	46	14
Prepare a printer spacing form	31	35	17	41
Use disk sort utility routines	32	16	19	37
Use tape file handling routines	33	32	12	52
Prepare a tape record layout	34	58	33	54
Read a memory dump	35	31	58	46
Write table building instructions	36	33	31	34
Use company system standards	37	18	53	8
Summarize calculations used in program	38	47	51	33
Summarize the controls in program to detect errors	39	41	48.5	25
Use card file handling routines	40	26	16	62

Table 9

Data Processing Employers Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Prepare a detail program flowchart	41	48	42	53
Write instructions for internal/external controls	42	37	57	38
Use random disk file handling routines	43	51	50	35
Recommend corrections or modifications to programs	44	29	45	23.5
Patch computer programs	45	50	32	55
Use standard flowchart symbols	46.5	23	23	51
Select appropriate data names for data	46.5	19	29	28
Divide a program into modules	48	53.5	52	40
Prepare a card record layout	49	52	22	59
Write report program generator language instructions	50	60	47	58
Read a trace	51	46	55	50
Prepare a system flowchart	52	61	44	45
Use data communications routines	53.5	62	68	4
Convert numbers between number systems	53.5	49	40	63
Work with users on problem	55	38.5	64	20
Use macros	56	57	54	56

Table 9

Data Processing Employers Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Use tape sort utility routines	57	53.5	36	64
Perform number system arithmetic	58	43	35	61
Edit program for effective use of auxiliary storage	59	59	63	48
Use virtual storage techniques	60	56	60	47
Write a detailed description of a problem	61	63.5	70	42
Operate computer for program tests	62	38.5	30	65
Write library routines	63	66	65	49
Select appropriate programming language for problem	64	69	61	66
Write table sorting instructions	65	63.5	59	60
Write assembler language instructions	66	65	62	69
Write check point-restart instructions	67	70.5	74	57
Write check digit checking routines	68	68	69	67
Convert a program to another language	69	72	66	73
Prepare a decision table	70	67	72	68
Write form test pattern routines	71	73	71	70

Table 9

Data Processing Employers Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Prepare printer carriage tape	72	70.5	67	71
Keypunch program	73	45	28	72
Prepare a grid chart	74	74	73	74
Prepare a paper tape record layout	75	75	75	75

A review of these competencies reveals several areas which show a difference in rank between Importance, Frequency, Performance and Future Need. A difference in rank of 15 or more was considered significant.

Table 10 gives those competencies which show a difference in rank of 15 or more between Importance and Frequency. A negative difference in rank indicates that the competency may not be performed frequently, but is ranked relatively high in importance. A positive difference in rank indicates that the competency is ranked relatively low in Importance, but is performed frequently.

Table 10

Data Processing Employers
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Frequency

Competency	Rank Importance	Rank Frequency	Difference in Rank
Select file organization & access methods for data files	28	55	-27
Prepare a disk record layout	19	44	-25
Prepare a tape record layout	34	58	-24

Table 10

Data Processing Employers
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Frequency

(Cont.)

Competency	Rank Importance	Rank Frequency	Difference in Rank
Prepare a program documentation manual	23	42	-19
Perform number system arithmetic	58	43	+15
Recommend corrections or modifications to programs	44	29	+15
Use disk sort utility routines	32	16	+16
Work with users on problem	55	38.5	+16.5
Use company system standards	37	18	+19
Use standard flowchart symbols	46.5	23	+23.5
Operate computer for program tests	62	38.5	+23.5
Select appropriate data names for data	46.5	19	+27.5
Keypunch program	73	45	+28

There are twice as many competencies which are ranked high in Frequency, yet relatively low in Importance. The two major competencies which show this are "Keypunch program", and "Select appropriate data names for data". The competency, "Select file organization and access methods for data files" was ranked high in Importance and low in Frequency.

A comparison of ranks between Importance and Performance is given in Table 11. A negative difference in rank indicates that the performance level is ranked lower than the importance of the competency, and may indicate areas which should receive more emphasis in training. A positive difference in rank indicates an area which may require less emphasis in training.

Table 11

Data Processing Employer
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Performance

Competency	Rank Importance	Rank Performance	Difference in Rank
Select file organization and access methods for data file	28	56	-28
Prepare a program documentation manual	23	48.5	-25.5
Write computer operator instructions	15	38	-23
Work with systems analyst on problem	18	41	-23
Write documentation updates after a program revision	20	43	-23
Read a memory dump	35	58	-23
Use structured programming techniques	30	46	-16
Use company system standards	37	53	-16
Prepare a disk record layout	19	34	-15
Write instructions for internal/external controls	42	57	-15
Read a cross-reference listing	26	9	+17
Select appropriate data names for data	46.5	29	17.5
Use tape file handling routines	33	12	+21
Use tape sort utility routines	57	36	+21

Table 11

Data Processing Employer
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Performance

(Cont.)

Competency	Rank Importance	Rank Performance	Difference in Rank
Perform number system arithmetic	58	35	+23
Use standard flowchart symbols	46.5	23	+23.5
Use card file handling routines	40	16	+24
Prepare a card record layout	49	22	+27
Operate computer for program tests	62	30	+32
Keypunch program	73	28	+45

Competencies which may require further emphasis in training are, "Select file organization and access methods for data files" and "Prepare a program documentation manual". These competencies were ranked high in Importance, yet low in Performance. Competencies ranked low in Importance and high in Performance showed, on the most part, a considerable difference in rank. The competency "Keypunch program" especially showed discrepancy between Importance and Performance. Other areas of possible overtraining include, "Operate computer for program tests" and "Prepare a card record layout".

The final categories to be compared on employer's response were Importance and Future Need. A negative difference in ranks in this area indicates that there will be less need for the competency in the future, while a positive difference indicates an increase in need. Table 12 shows those competencies with a difference in rank of 15 or more.

Table 12

Data Processing Employers
Competencies Showing a Difference in Rank of
15 or More Between Importance and Future Need

Competency	Rank Importance	Rank Future Need	Difference In Rank
Use coding sheets	8	39	-31
Use card file handling routines	40	62	-22
Prepare a general (logic) program flowchart	24	44	-20
Prepare a tape record layout	34	54	-20
Use tape file handling routines	33	52	-19
Read a cross-reference listing	26	43	-17
Correct syntax (clerical) errors	4	19	-15
Use structured programming techniques	30	14	+16
Select appropriate data names for data	46.5	28	+18.5
Write a detailed description of a problem	61	42	+19
Recommend corrections or modifications to program	44	23.5	+20.5
Use company system standards	37	8	+29
Work with users on problem	55	20	+35
Use data communications routines	53.5	4	+49.5

A review of this table shows a probable decrease in the need for the competency "Use coding sheets" which is presently ranked very high in Importance. The competency "Use data communications routines" shows a mailed increase in Future Need, as do the competencies "Work with users on problem" and "Use company system

standards". It can be anticipated that these areas will be of high importance in the future.

A review of employer response identifies competencies which may require a change of emphasis in training. Listed below are those competencies which may require more emphasis. In these areas, both Importance and Future Need are ranked relatively high, with Frequency and Performance ranked low. The competency "Recommend corrections or modifications to program" is included in this group because of the anticipated high Future Need.

Prepare a disk record layout
Prepare a program documentation manual
Select file organization and access methods for data file
Use structured programming techniques
Use company system standards
Recommend corrections or modifications to programs
Work with users on problem

The following competencies may require less emphasis than they presently receive. These areas are ranked relatively low on Importance and Future Need, and are ranked high on Frequency and Performance.

Read a cross reference listing
Use tape file handling routines
Prepare a tape record layout
Use card file handling routines
Use standard flowchart symbols
Perform number system arithmetic
Operate computer for program test
Keypunch program

The competency "Select appropriate data names for data" should probably receive the same amount of emphasis as it now receives. Although the Performance is ranked much higher than the Importance of this competency, the anticipated Future Need will probably justify the present level of training.

Rank correlations were computed between areas of response using Spearman's Rank Correlation Coefficient, adjusting for tied ranks. Table 13 gives these correlations.

Table 13

Data Processing Employers
Rank Correlations

Area of Response	Rank Correlation
Importance/Frequency	0.89
Importance/Performance	0.80
Importance/Future Need	0.83
Performance/Frequency	0.86
Performance/Future Need	0.50
Frequency/Future Need	0.75

All correlations are significant at the .01 level. The highest correlation was between Importance and Frequency. As with the graduate response, the lowest correlation was between Performance and Future Need.

CHAPTER V

INSTRUCTOR RESPONSE

RESEARCH FINDINGS AND ANALYSIS

A copy of the competency list was sent to instructors of the Data Processing Associate program. Of the 29 instructors who received the survey instruments, 15 were returned for a 52 percent response. Because of this low response rate, both in actual numbers and percentage, the following information should be interpreted with caution. This information is presented to attempt to show trends in instruction and to offer some basis of comparison between graduates, employers and instructors. Table 14 shows a comparison of instructor's ranks between competencies. Appendix D gives the complete data including means and standard deviations.

Table 14

Data Processing Instructors Competency Ranks
N = 15

Competency	Importance	Frequency	Performance	Future Need
Write comments in program	1.5	6	5	2
Read a program listing	1.5	3.5	5	2
Write higher level language	4.5	8.5	1.5	7
Desk check a program	4.5	2.5	8	11.5
Correct logical errors	4.5	2.5	8	2
Test program using test data	4.5	6	8	5
Write edit routines	8	15	18	20.5
Use coding sheets	8	2.5	1.5	26.5
Correct syntax (clerical) errors	8	6	5	20.5
Prepare a test data for programs	10.5	28	10.5	14

Table 14

Data Processing Instructors Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Write sequential disk file handling routines	10.5	13	3	20.5
Write error routines	12	15	14	11.5
Write table searching instructions	13	30	10.5	9
Use index-sequential disk file handling routines	14.5	20.5	14	5
Use job control language (Control Cards)	14.5	10	14	20.5
Use tape file handling routines	16.5	19	20.5	41.5
Test program using live (user) data	16.5	26	20.5	15.5
Write table building instructions	18	40	17	30
Select appropriate data names for data	20	8.5	14	11.5
Use macros	20	17.5	20.5	32.5
Read a file dump	20	20.5	20.5	20.5
Prepare a general (logic) program flowchart	24	17.5	23	26.5
Select file organization & access methods for data files	24	57.5	24	36.5
Read a trace	24	26	34	20.5
Edit program for effective use of auxiliary storage	24	56	37	8
Write computer operator instructions	24	40	31.5	39.5

Table 14

Data Processing Instructors Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Use standard flowchart symbols	27	11.5	25	20.5
Prepare a program documentation manual	28.5	49.5	42.5	36.5
Perform program maintenance	28.5	26	26	36.5
Write report program generator language instructions	30	44.5	38	36.5
Read a memory dump	31.5	30	40	26.5
Read a cross-reference listing	31.5	23	29	32.5
Write documentation updates after a program revision	33	35.5	31.5	29
Use company system standards	36	15	29	15.5
Work with other programmers on problem	36	23	50	49
Prepare a printer spacing form	36	23	29	32.5
Use disk sort utility routines	36	40	34	32.5
Use card file handling routines	36	11.5	14	57.5
Use structured programming techniques	39.5	35.5	47.5	5
Recommend corrections or modifications to programs	39.5	44.5	36	20.5
Write subroutines	42	33	40	41.5

Table 14

Data Processing Instructors Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Use library routines	42	35.5	45	26.5
Write instructions for internal/external controls	42	32	27	45.5
Divide a program into modules	44.5	43	47.5	43.5
Use random disk file handling routines	44.5	49.5	42.5	43.5
Use virtual storage techniques	46	59.5	61.5	39.5
Prepare a detail program flowchart	47.5	30	40	47
Write assembler language instructions	47.5	59.5	51	54.5
Use data communications routines	49.5	67.5	53.5	11.5
Patch computer programs	49.5	64	53.5	68
Select appropriate programming language for problem	51	72.5	49	57.5
Work with systems analyst on problem	52	35.5	58	54.5
Write table sorting instructions	54	57.5	45	59
Summarize the controls in program to detect errors	54	46.5	56.5	51.5
Summarize calculations used in program	54	46.5	56.5	51.5
Prepare a tape record layout	56.5	53.5	61.5	51.5

Table 14

Data Processing Instructors Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Prepare a disk record layout	56.5	53.5	61.5	48
Work with users on problem	58	49.5	66	56
Write check digit checking routines	59	53.5	64.5	62
Write a detailed description of a problem	60.5	61	53.5	60
Write library routines	60.5	69	67	45.5
Perform number system arithmetic	62	62	45	51.5
Prepare a card record layout	63	40	53.5	62
Prepare a system flowchart	64	63	59	66
Convert numbers between number systems	65	67.5	34	68
Use tape sort utility routines	67	49.5	64.5	68
Write check point-restart instructions	67	65	69	62
Write form test pattern routines	67	66	68	64.5
Operate computer for program tests	69	40	61.5	70
Convert a program to another language	70	70	73	64.5
Prepare printer carriage tape	71	71	72	71

Table 14

Data Processing Instructors Competency Ranks

(Cont.)

Competency	Importance	Frequency	Performance	Future Need
Keypunch program	72	53.5	70	73
Prepare a decision table	73	72.5	71	72
Prepare a grid chart	74	75	75	74
Prepare a paper tape record layout	75	74	74	75

Competencies were ranked according to the importance of the competency on the job, which was used as a standard of comparison for Frequency, Performance and Future Need. In comparing these areas, a difference in rank of 15 or more was considered significant.

Table 15 gives those competencies which show a difference in rank of 15 or more between Importance and Frequency. A negative difference in rank indicates that the competency may not be performed frequently, but is ranked relatively high in importance. A positive difference in rank indicates that the competency may be ranked relatively low in importance, but is performed frequently.

Table 15

Data Processing Instructors
Competencies Showing a Difference in Rank of
15 or More Between Importance and Frequency

Competency	Rank Importance	Rank Frequency	Difference in Rank
Select file organization and access methods for data files	24	57.5	-33.5
Edit program for effective use of auxiliary storage	24	56	-32
Write table building instructions	18	40	-22
Select appropriate programming language for problem	51	72.5	-21.5

Table 15

Data Processing Instructors
Competencies Showing a Difference in Rank of
15 or More Between Importance and Frequency

(Cont.)

Competency	Rank Importance	Rank Frequency	Difference in Rank
Prepare a program documentation manual	28.5	49.5	-21
Use data communications routines	49.5	67.5	-18
Prepare a test data for programs	10.5	28	-17.5
Write table searching instructions	13	30	-17
Write computer operator instructions	24	40	-16
Use standard flowchart symbols	27	11.5	+15.5
Work with systems analyst on problem	52	35.5	+16.5
Prepare a detail program flowchart	47.5	30	+17.5
Use tape sort utility routines	67	49.5	+17.5
Keypunch program	72	53.5	+18.5
Use company system standards	36	15	+21
Use card file handling routines	36	11.5	+24.5
Operate computer for program tests	69	40	+29

Two competencies, "Select file organization and access methods for data files" and "Edit program for effective use of auxiliary storage", are not considered to be performed frequently, yet are ranked relative high in importance. The competency "Operate computer for program tests", however, is performed relatively frequently as compared to its rank on importance.

A comparison of ranks between Importance and Performance is given in Table 16. A negative difference in rank indicates that Performance is ranked relatively lower than Importance, and may indicate that further training is needed in these areas. A positive difference in rank indicates areas which may require less emphasis in training.

Table 16

Data Processing Instructors
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Performance

Competency	Rank Importance	Rank Performance	Difference in Rank
Use virtual storage techniques	46	61.5	-15.5
Write instructions for internal/ external controls	42	27	+15
Perform number system arithmetic	62	45	+17
Use card file handling routines	36	14	+22
Correct numbers between number systems	65	34	+31

Instructor response show only one competency, "Use virtual storage techniques", which was ranked significantly lower in Performance than Importance.

A comparison was also done between Importance and Future Need. Table 17 shows this comparison. Again, a negative difference indicates that there may be less need for the competency in the future, and a positive difference indicates a possible increase in Future Need.

Table 17

Data Processing Instructors
Competencies Showing a Difference in Rank
of 15 or More Between Importance and Future Need

Competency	Rank Importance	Rank Future Need	Difference in Rank
Use tape file handling routines	16.5	41.5	-25
Use card file handling routines	36	57.5	-21.5
Use coding sheets	8	26.5	-18.5
Patch computer programs	49.5	68	-18.5
Write computer operator instructions	24	39.5	-15.5
Write library routines	60.5	45.5	+15
Use library routines	42	26.5	+15.5
Edit program for effective use of auxiliary storage	24	8	+16
Recommend corrections or modifications to programs	39.5	20.5	+19
Use company system standards	36	15.5	+20.5
Use structured programming techniques	39.5	5	+34.5
Use data communications routines	49.5	11.5	+38

Instructors appear to see a decreasing need for the competencies, "Use tape file handling routines" and "Use card file handling routines". Competencies for which there seems to be an increasing need are, "Use data communications routines" and "Use structured programming techniques".

A review of instructor response identifies two competencies which may show a need for further training. These competencies are ranked low in Frequency and Performance and high in Importance and Future Need.

Edit program for effective use of auxiliary storage
Use data communications routines

There was only one competency which, because of the relatively high ranks in Frequency and Performance, may require less emphasis in training. This competency is, "Use card file handling routines".

The following two competencies should probably maintain the present level of training.

Write computer operator instructions
Use company system standards

Rank correlations were computed between areas of response using Spearman's Rank Correlation Coefficient, adjusting for tried ranks. Table 18 gives these correlations.

Table 18

Data Processing Instructor
Rank Correlations

Area of Response	Rank Correlation
Importance/Frequency	0.85
Importance/Performance	0.94
Importance/Future Need	0.88
Performance/Frequency	0.85
Performance/Future Need	0.80
Frequency/Future Need	0.73

All correlations were significant at the .01 level, with all areas showing a high degree of agreement.

CHAPTER VI

SUMMARY OF SURVEY RESPONSES

A comparison of responses was made between Data Processing graduates and employers to determine which competencies were ranked highest and lowest in each category of Importance, Frequency, Performance and Future Need. The cumulative rank of graduates and employers was calculated for each competency in each category, and these tasks were then ranked to determine the order of importance placed on each competency. Instructor responses were not included in this tabulation as it was felt that the number of instructor responses could not be considered statistically significant.

The following tables give the ten highest and lowest ranked competencies for each category.

Table 19

Importance-Ten Highest and Lowest Ranked Competencies

Rank	Competency	Rank	Competency
1	Read a program listing	65.5	Write table sorting instructions
2	Correct logical errors	65.5	Write library routines
3	Desk check a program	67.5	Write check digit checking routines
4	Correct syntax (clerical) errors	67.5	Write check point-restart instructions
5	Test program using test data	69	Write form test pattern routine
6	Write higher level language instructions	70.5	Prepare a decision table
7.5	Use job control language (control cards)	70.5	Convert a program to another language
7.5	Test program using live (user) data	72	Keypunch program
9	Use coding sheets	73	Prepare printer carriage tape
10	Prepare a test data for programs	74	Prepare a grid chart
		75	Prepare a paper tape record layout

Table 20

Frequency-Ten Highest and Lowest Ranked Competencies

Rank	Competency	Rank	Competency
1	Read a program listing	66	Write library routines
3	Correct synax (clerical) errors	67	Write check digit checking routines
3	Desk check a program	68	Select appropriate programming language for problem
3	Use coding sheets	69	Prepare a decision table
5.5	Correct logical errors	70	Write check point-restart instructions
5.5	Use job control language (control cards)	71	Write form test pattern routines
7.5	Test program using test data	72	Prepare printer carriage tape
7.5	Work with other programmers on problem	73	Convert a program to another language
9	Write comment in programs	74	Prepare a grid chart
10	Perform program maintenance	75	Prepare a paper tape record layout

Table 21

Performance-Ten Highest and Lowest Ranked Competencies

Rank	Competency	Rank	Competency
1.5	Read a program listing	66.5	Write library routines
1.5	Use coding sheets	66.5	Write check digit checking routines
3	Correct syntax (clerical) errors	68	Convert a problem to another language
4	Desk check a program	69.5	Write a detailed description of a problem
5	Correct logical errors	69.5	Write form test pattern routines
6	Use job control language (control cards)	71	Prepare printer carriage tape
7	Test program using test data	72	Prepare a decision table
8	Read a cross-reference listing	73	Write check point-restart instructions
9	Write comment in program	74	Prepare a grid chart
10	Write higher level language instructions	75	Prepare a paper tape record layout

Table 22

Future Need-Ten Highest and Lowest Ranked Competencies

Rank	Competency	Rank	Competency
1.5	Correct logical errors	66	Write check digit checking routines
1.5	Desk check a program	67	Select appropriate programming language for problems
3	Read a program listing	68	Write assembler language instructions
4	Prepare a test data for programs	69	Write form test pattern routines
5	Test program using test data	70	Prepare a decision table
6	Write higher level language on instructions	71	Convert a program to another language
7	Write comment in program	72.5	Keypunch program
8	Use data communications on routines	72.5	Prepare printer carriage tape
9	Use structured programming techniques	74	Prepare a grid chart
10	Use job control language (control cards)	75	Prepare a paper tape record layout

In reviewing Table 20, regarding Frequency, this should not be confused with Importance. Although there is a high correlation between these two categories in this study, it is possible for a competency to be performed infrequently, yet be of major importance; or conversely, to be performed frequently and be of low importance. This information is of value in reviewing competencies.

It should also be noted regarding Table 21 on Performance that a competency ranked low in performance is not necessarily an area of undertraining. Many competencies ranked low in performance are also ranked low in importance and are, therefore, at an appropriate level of training.

In comparing responses, correlations were done between categories of response and between groups of respondents. Spearman's Rank Correlation Coefficient was used, adjusting for tied ranks. All correlations were significant at the .01 level. Table 23 gives the correlations between categories by respondent.

Table 23

Rank Correlation Between Importance, Frequency, Performance and Future Need

Category	Graduate	Employer	Instructor
Importance/Frequency	0.89	0.89	0.85
Importance/Performance	0.86	0.80	0.94
Importance/Future Need	0.90	0.83	0.88
Performance/Frequency	0.90	0.86	0.85
Performance/Future Need	0.69	0.50	0.80
Frequency/Future Need	0.80	0.75	0.73

Although all correlations are at the .01 level of significance, the lowest correlations are found in the graduate and employer responses between Performance and Future Need. This is to be expected since, although programs need to keep an eye on future development within the field, training is geared to entry level jobs with todays requirements. Some of the highest correlations were found between Importance and Frequency; Performance and Frequency and between Importance and Future Need. The highest correlation in the instructor response was between Importance and Performance.

Table 24

Rank Correlations Between Graduates, Employers and Instructors

Respondents	Importance	Frequency	Performance	Future Need
Graduate/Employer	0.92	0.96	0.94	0.94
Employer/Instructor	0.79	0.85	0.79	0.75
Graduate/Instructor	0.82	0.88	0.73	0.74

All correlations between graduates and employers were extremely high. The highest correlation in all groups was on Frequency, which indicates general agreement regarding how often a competency is performed on the job. The lowest correlation was between graduates and instructors regarding the level of performance of the competency on the job.

CHAPTER VII

INTERVIEWS

The mailed survey instrument was entirely objective in nature. This was designed to facilitate the completion of the instrument and for analyzing of the data. It is recognized, however, that a total picture cannot be obtained solely by objective means. Therefore, interviews were conducted of 31 graduates and 32 employers to supplement the information received on the survey instrument. Interviews were restricted to the southern part of Wisconsin, including Madison and Milwaukee. Several of the questions asked of graduates and employers were the same to allow for comparison. Appendix C gives the interviewer's introductory letter and interview guide, with a tabulation of responses.

Both graduates and employers were asked what job position the graduate held in the job. The most common job title was Programmer, with 78 percent of those interviewed working as a programmer.

Graduates were asked the title of their first job after graduation. Again the majority stated that they had worked as a programmer immediately after graduation. Other common job titles were Computer Operator and Computer Applications Technician.

When asked about the necessity of a Data Processing Associate Degree in obtaining a job, both graduates and employers indicated that the degree was helpful, although in most cases employers felt that it was not required. Employers also stated a definite need for the skills taught in the Data Processing Associate Degree program.

Both graduates and employers were asked if employees were encouraged to take advantage of the Data Processing program. Responses from both groups were very close, with the majority of both graduates and employers stating that employees were encouraged to take advantage of this program.

There was also close agreement between graduates and employers when asked about opportunities for advancement on the job. Both groups showed very positive feelings regarding job advancement, with employers being somewhat more optimistic regarding opportunities for advancement.

Graduates and employers were asked what skills they felt were most important in obtaining entry level jobs. Programming and COBOL were the two major skills mentioned most often by graduates and employers. Employers placed more emphasis on logic, attitude and communication skills than did graduates.

Graduates were asked what instructional areas they felt to be most and least helpful in the Data Processing program. Instructors were indicated by being most helpful by the majority of respondents, followed by textbooks. Responses as to which areas could use improvement were not conclusive, though textbooks, equipment and audio-visual were mentioned most often. Methods of improvement included updating of materials and more comprehensive materials including use of a wider range of concepts and equipment.

Graduates were also asked if there were any areas of further training which should be included in the Data Processing program. Structured Programming, JCL and Data Base Systems were cited most often as areas which should be included in the program. Again, there were a variety of responses to this question, with no one area standing out from the others.

Employers were asked in which areas they felt graduates were strongest. COBOL and a basic understanding of programming were the two major areas of response. These are also the two skills employers felt were most important in obtaining an entry level job. Employers also placed much value on such skills as motivation, attitude and communications.

When asked in which areas graduates could use improvement, employers most often responded JCL, Documentation and Communication, although response was varied, and results inconclusive. Employers were also asked how these areas could be improved, and the response was that more training and experience was needed in these areas.

Employers showed a very positive response regarding hiring other graduates of Data Processing Associate Degree programs, with 91 percent stating that they would hire other graduates of this program.

Comments regarding the Data Processing Associate Degree program were very positive. The single most common response of graduates was that the Data Processing program was a good overall program. Both graduates and employers stressed the importance of hands-on experience and structured programming.

CHAPTER VIII

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to assess the effect of competencies taught in the Wisconsin Vocational, Technical and Adult Education Data Processing Associate Degree program to required on the job skills.

It is felt the best source of information regarding the effectiveness of the Data Processing curriculum would be graduates and instructors of the program and employers of graduates. The findings of the study, therefore, are based on data received from these three sources.

Conclusions

In reviewing the findings with respect to the objectives of the study, the following conclusions are made:

1. The following competencies were identified by both graduates and employers as areas which are performed frequently, yet are ranked low in importance:

   Use company system standards
   Keypunch program
   Use standard flowchart symbols
   Select appropriate data names for data
   Operate computer for program test

   Only one competency was identified by both graduates and employers as being performed infrequently, and ranked high in importance:

   Prepare a program documentation manual

2. The following competencies were identified by both graduates and employers as being ranked high in Importance and low Performance. This may indicate areas of undertraining.

   Read a memory dump
   Work with systems analyst on problem
   Prepare a program documentation manual
   Select file organization and access methods for data files
   Write computer operator instructions

Competencies which were ranked high on Performance and low in Importance are listed below. This may indicate areas of overtraining:

Keypunch program
Prepare a card record layout
Use standard flowchart symbols
Use card file handling routines
Select appropriate data names for data

3. The competencies listed below show a high rank on Importance, and a relatively low rank on Future Need. These areas may be of decreasing importance in the future:

Use coding sheets
Use card file handling routines
Use tape file handling routines
Correct syntax (clerical) errors

The following competencies are ranked low in Importance and high in Future Need. These competencies may be of increasing importance in the future:

Use data communications routines
Work with users on problems
Use company system standards
Use structured programming techniques
Recommend corrections or modifications to programs

4. Correlations between graduates, employers and instructors and between Importance, Frequency, Performance and Future Need are consistently high. This indicates a high degree of agreement between groups and between areas of response.

5. The most common job title of graduates was programmer. Of the graduate respondents, 71 percent indicated that they worked in some capacity as a programmer. Opportunities to advance on the job appear to be quite good.

6. Employers indicate that an Associate Degree from a Wisconsin Vocational, Technical and Adult Education Institute is not necessary in most cases in obtaining a job, although the majority of employers state it is helpful. This indicates that a graduate of the Data Processing program may have a valuable asset in obtaining employment in today's job market.

7. The two most important skill areas for obtaining entry level positions are a knowledge of programming and COBOL. Employers also place much emphasis on logic and attitudinal skills.

8. Comments regarding the Data Processing program indicate a need for more emphasis on hands-on experience and structured programming. Graduate response was very positive, with many comments regarding the excellence of the Data Processing program.

9. The three areas graduates found to be most helpful in the program were instructors, textbooks and equipment. Graduate response as to which areas need improvement was inconclusive, with no one area standing out, although textbooks, equipment and other audio-visual were mentioned most often. Suggestions for improving these areas specified that more time be spent in the use of these resources and that updating in these areas is needed.

10. Employers felt graduate's skills were strongest in the area of COBOL and a basic understanding of programming. These were also identified as the two most important skills in obtaining an entry level position.

11. Employer respondents indicate a definite need for the skills acquired in the Data Processing Associate Degree program. The majority of employers encourage their employees to take advantage of this program, and intend to hire graduates of the program in the future.

12. This study indicates that the Wisconsin Vocational, Technical and Adult Education Data Processing Associate Degree program is basically well structured and well taught.

Recommendations

Based on the results of the study, the following recommendations are made:

1. That training emphasis on the following competencies be evaluated and adjusted to fit the needs of employees.

   Competencies which may need more emphasis:
   - Read a memory dump
   - Work with systems analyst on problem
   - Prepare a program documentation manual
   - Select file organization and access methods for data files
   - Write computer operator instructions

Competencies which may need less emphasis:
- Keypunch program
- Prepare a card record layout
- Use standard flowchart symbols
- Use card file handling routines
- Select appropriate data names for data

2. That the following competencies be evaluated in terms of Future Need for the competency, and training in these areas be adjusted accordingly.

   Areas of possible decreasing importance:
   - Use coding sheets
   - Use card file handling routines
   - Use tape file handling routines
   - Correct syntax (clerical) errors

   Areas of possible increasing importance:
   - Use data communications routines
   - Work with users on problem
   - Use company system standards
   - Use structured programming techniques
   - Recommend corrections or modifications to program

3. That because of the importance employers place on structured programming and hands-on experience, additional emphasis should be placed on these areas.

4. That increased lab time be made available to students to allow them to receive more practical, hands-on experience.

5. That an effort be made to update material such as textbooks, films, handouts and other audio-visuals, to include new types of equipment and processes.

Appendix A

Survey Cover Letters

State of Wisconsin \ BOARD OF VOCATIONAL, TECHNICAL & ADULT EDUCATION

EUGENE LEHRMANN
State Director
4802 Sheboygan Avenue
MADISON, WISCONSIN 53702

February 16, 1976

Dear Graduate:

The Vocational, Technical and Adult Education System in Wisconsin is conducting a statewide research study aimed at identifying job tasks, performance levels, general education, and other learning experiences as they relate to data processing programmers. District One and Gateway Technical Institutes have been designated to conduct this study as a cooperative project. The results of this study will be used to revise and update the data processing program in an effort to prepare people better for the world of work.

As a graduate of an associate degree data processing program, your assistance would be of great value. We would greatly appreciate your taking about twenty minutes to complete the enclosed questionnaire and return it, together with the informational cover sheet, in the enclosed, self-addressed envelope. If your position does not involve programming, please answer only the questions on the informational cover sheet and return.

If you have any questions concerning the survey, please call Joseph N. Kettner, District One Technical Institute-Eau Claire, 715-836-3933.

In an effort to obtain an even better analysis of needed program changes, we would also like to receive input from your supervisor if he/she supervises people that do programming. With this in mind, would you please give the other questionnaire packet to your supervisor and ask that he/she complete and return it.

The results of this survey will be furnished to you upon your request.

Sincerely,

Eugene Lehrmann

Eugene Lehrmann
State Director

EL:go

Enclosures

State of Wisconsin \ BOARD OF VOCATIONAL, TECHNICAL & ADULT EDUCATION

EUGENE LEHRMANN
[illegible]
MADISON, WISCONSIN

February 16, 1976

Dear Employer/Supervisor:

The Vocational, Technical and Adult Education System in Wisconsin is conducting a statewide research study aimed at identifying job tasks, performance levels, general education, and other learning experiences as they relate to data processing programmers. District One and Gateway Technical Institutes have been designated to conduct this study as a cooperative project. The results of this study will be used to revise and update the data processing program in an effort to prepare people better for the world of work.

As a supervisor of a graduate(s) of an associate degree data processing program, your assistance would be of great value. We would greatly appreciate your taking about twenty minutes in order to complete the attached questionnaire and return it, together with the informational cover sheet, in the enclosed, self-addressed envelope. We have asked one of our graduates who is employed under your supervision to seek your cooperation. This employee, through an interest in upgrading his/her occupation/profession, is also cooperating with us in this study.

If you have any questions concerning the survey, please call Joseph N. Kettner, District One Technical Institute-Eau Claire, 715-836-3933.

The results of this survey will be furnished to you upon your request.

Sincerely,

Eugene Lehrmann

Eugene Lehrmann
State Director

EL:go

Enclosures

GATEWAY TECHNICAL INSTITUTE

District Office:
3520 - 30th Avenue
Kenosha, WI 53140
Phone: (414) 658-4371

Racine Campus
1001 South Main Street
Racine, WI 53403
Phone: (414) 637-9881

Elkhorn Campus
E. Centralia St. & Hwy. H
Elkhorn, WI 53121
Phone: (414) 723-5390

WGTD
91.1 FM Radio
Kenosha, WI 53140
Phone: (414) 552-9483

Keith W. Stoehr
District Director

March 31, 1976

Gateway Technical Institute is currently conducting a statewide curriculum study of the Wisconsin Vocational Technical Data Processing Associate Degree Programs. The purpose of this study is to determine the relevancy of the Data Processing programs to actual work experiences of our graduates.

As a Data Processing instructor, your participation in this study would be of great value in determining the expected job requirements of our graduates in the Data Processing field.

Enclosed is a survey instrument, which was developed in cooperation with District One--Eau Claire, which has been sent to Data Processing graduates and their supervisors/employers. We would greatly appreciate your completing this questionnaire and returning it promptly. All information will be kept confidential. A stamped, self-addressed envelope is enclosed for your convenience.

Thank you for your time and assistance.

Sincerely,

Lauren DeVuyst

Lauren DeVuyst
Research Assistant
Research and Planning

LD:cl

Enclosures

Appendix B

Survey Instrument

District One (Eau Claire) and Gateway (Kenosha) Technical Institutes February, 1976

ENTRY LEVEL PROGRAMMER TASK INVENTORY

DEFINITIONS FOR SURVEY RATINGS

Frequency

1=Never..... Not performed by entry level programmer.
2=< Monthly. Performed less than monthly (bi-monthly, quarterly, etc.) by entry level programmer.
3=Monthly... Performed monthly by entry level programmer.
4=Weekly.... Performed weekly by entry level programmer.
5=Daily..... Performed daily by entry level programmer.

Performance

1=Very Low.. Merely assists others in performing this task.
2=Low..... Performs task satisfactorily with constant supervision and some assistance.
3=Average... Performs this task satisfactorily with limited supervision.
4=High..... Performs this task satisfactorily without assistance or supervision.
5=Very High. Performs this task satisfactorily without assistance or supervision and can lead others in performing this task.

Importance

1=Slight.... Mastery of this task is only slightly important for entry level employment.
2=Some..... Mastery of this task is of some importance for entry level employment.
3=Important. Mastery of this task is important for entry level employment.
4=Very..... Mastery of this task is very important for entry level employment.
5=Critical.. Mastery of this task is critical for entry level employment.

Future Need

1=Very Low.. Need for task will decrease greatly during the next five years.
2=Low..... Need for task will decrease during the next five years.
3=No Change. Need for task will remain the same for the next five years.
4=High..... Need for task will increase during the next five years.
5=Very High. Need for task will increase greatly during the next five years.

* * * \

District One (Eau Claire) and Gateway (Kenosha) Technical Institutes February, 1976

ENTRY LEVEL PROGRAMMER TASK INVENTORY

DIRECTIONS: Carefully read each task statement and respond as it would relate to any entry level programmer where you work. In making this response, circle a "1" (Never) under the FREQUENCY column if the task is not performed by entry level programmers and proceed to column (D) FUTURE NEED. If the task is performed by entry level programmers, please complete all four columns.

At the end of each group, list and rate any other tasks which are performed.

		A FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	B PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	C IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	D FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
1.00	SYSTEMS ANALYSIS AND DESIGN				
1.01	Use company system standards	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.02	Write a detailed description of a problem.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.03	Work with users on problem	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.04	Work with systems analyst on problem	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.05	Work with other programmers on problem	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.06	Prepare a system flowchart	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.07	Prepare a card record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.08	Prepare a printer spacing form	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.09	Prepare a tape record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.10	Prepare a disk record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.11	Prepare a paper tape record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.12	Other_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.00	PROGRAM DESIGN				
2.01	Use standard flowchart symbols	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.02	Prepare a general (logic) program flowchart.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.03	Prepare a detail program flowchart	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.04	Prepare a grid chart	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.05	Prepare a decision table	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.06	Divide a program into modules.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.07	Use structured programming techniques.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.08	Prepare a test data for programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

ENTRY LEVEL PROGRAMMER TASK INVENTORY	FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High. 5=Very High
2.00 PROGRAM DESIGN (Continued)				
2.09 Select appropriate data names for data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.10 Select file organization & access methods for data files	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.11 Select appropriate programming language for problem. .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.12 Other_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.00 CODING				
3.01 Write assembler language instructions.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.02 Write higher level language instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.03 Write report program generator language instructions .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.04 Use tape sort utility routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.05 Use disk sort utility routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.06 Write table building instructions.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.07 Write table searching instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.08 Write table sorting instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.09 Write sequential disk file handling routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.10 Use index-sequential disk file handling routines . . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.11 Use random disk file handling routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.12 Use tape file handling routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.13 Use card file handling routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.14 Use data communications routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.15 Write subroutines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.16 Write error routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.17 Use library routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.18 Write library routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.19 Use macros	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.20 Write comments in program.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.21 Write instructions for internal/external controls. . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

ENTRY LEVEL PROGRAMMER TASK INVENTORY

		FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
3.00	CODING (Continued)				
3.22	Write edit routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.23	Write check digit checking routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.24	Write check point-restart instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.25	Write form test pattern routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.26	Use coding sheets.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.27	Other_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.00	TESTING AND DEBUGGING				
4.01	Read a program listing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.02	Desk check a program	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.03	Correct syntax (clerical) errors	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.04	Correct logical errors	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.05	Read a trace	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.06	Read a memory dump	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.07	Read a file dump	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.08	Read a cross-reference listing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.09	Test program using test data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.10	Test program using live (user) data.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.11	Edit program for effective use of auxiliary storage. .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.12	Recommend corrections or modifications to programs . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.13	Other_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.00	DOCUMENTATION				
5.01	Prepare a program documentation manual	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.02	Write computer operator instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.03	Write documentation updates after a program revision .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.04	Summarize the controls in program to detect errors . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.05	Summarize calculations used in program	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.06	Other_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

ENTRY LEVEL PROGRAMMER TASK INVENTORY

		FREQUENCY 1=Never 2= <Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
6.00	MISCELLANEOUS				
6.01	Keypunch program	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.02	Patch computer programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.03	Perform program maintenance	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.04	Convert a program to another language	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.05	Operate computer for program tests	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.06	Use job control language (Control Cards)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.07	Use virtual storage techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.08	Perform number system arithmetic	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.09	Convert numbers between number systems	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.10	Prepare printer carriage tape	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.11	Other_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

N O T E : This section to be filled out by graduates only.

Indicate the amount of emphasis you feel should be given to the following areas of instruction:

EMPHASIS
1=Little or no emphasis
2=Less emphasis than now receiving
3=Same as present
4=More emphasis than now receiving
5=Of major importance--greater emphasis

7.00	GENERAL EDUCATION AND LEARNING EXPERIENCES	
7.01	Accounting	1 2 3 4 5
7.02	American Institutions (Government)	1 2 3 4 5
7.03	Communications Skills (English)	1 2 3 4 5
7.04	State Competitive Data Processing Exams	1 2 3 4 5
7.05	Economics	1 2 3 4 5
7.06	Effective Speaking (Speech)	1 2 3 4 5
7.07	Field Trips	1 2 3 4 5
7.08	Student Data Processing Clubs	1 2 3 4 5
7.09	Office Management	1 2 3 4 5
7.10	Psychology of Human Relations	1 2 3 4 5
7.11	Statistics	1 2 3 4 5

PLEASE RETURN TO:

Joseph N. Kettner, Jr.
District 1 Technical Inst.
620 West Clairemont Avenue
Eau Claire, WI 54701

VTAE District No. 9

Appendix C

Interview Procedure and Tabulation

GTI
GATEWAY TECHNICAL INSTITUTE

District Office:
3520 - 30th Avenue
Kenosha, WI 53140
Phone: (414) 658-4371

Racine Campus
1001 South Main Street
Racine, WI 53403
Phone: (414) 637-9881

Elkhorn Campus
E. Centralia St. & Hwy. H
Elkhorn, WI 53121
Phone: (414) 723-5390

WGTD
91.1 FM Radio
Kenosha, WI 53140
Phone: (414) 552-9483

Keith W. Stoehr
District Director

March 1, 1976

Dear Sir:

Gateway Technical Institute, in cooperation with District One Technical Institute - Eau Claire, is conducting a statewide study of the Data Processing Associate Degree Program. The purpose of this study is to determine the relevancy of the Wisconsin Vocational Technical Adult Education Data Processing Programs to actual work experiences of graduates of the program.

As an integral part of this study, Gateway is conducting interviews of graduates and their immediate supervisors/employers. Mr. Robert Myers, as the principal interviewer for this project, would appreciate having a few minutes of your time to assist him in determining the educational needs of students enrolled in Data Processing Programs.

Sincerely,

William J. Becker

William J. Becker
Assistant Director
Research and Planning

cl

DATA PROCESSING

GRADUATES

1. What is your present job title?

   _____ Computer Programmer

   _____ Programmer

   _____ Jr. or Trainee Programmer

   _____ Other _____

2. What was your first job after graduation?

3. Was your degree necessary in obtaining your present job?

   _____ Yes _____ No _____ Don't Know

4. What is your opportunity to advance on the job, to further utilize your training?

   _____ Excellent _____ Poor _____ Good _____ None

5. Are employees encouraged to take advantage of Vocational Technical education?

6. What skills do you feel were most important in obtaining your first job in data processing?

7. Which three areas did you find most helpful in this program?

   _____ Instructors _____ Films _____ Equipment

   _____ Handouts _____ Textbooks _____ Other audio-visual materials

   _____ Field trips to local industry _____ Other _____

8. Which three areas could be improved?

_____ Instructors _____ Films _____ Equipment

_____ Handouts _____ Textbooks _____ Other audio-visual materials

_____ Field trips to local industry _____ Other _____

9. How do you feel the above three areas could be improved?

a.)_____

b.)_____

c.)_____

10. Are there any areas you were not trained for which you feel should be included in the program? What are they?

_____

_____

11. We would appreciate any comments you may have concerning this program:

_____

_____

_____

_____

_____

DATA PROCESSING

EMPLOYERS

1. What position does the graduate of this program hold in your company?

   ____ Computer Operator

   ____ Programmer

   ____ Jr. or Trainee Programmer

   ____ Other_____

2. To what extent was the degree a factor in hiring the individual for the position?

   ____ Required

   ____ Helpful but not required

   ____ Prefer actual work experience

   ____ Prefer to train ourselves

   ____ Not needed at all

3. In your company, is there a need for the skills the student acquires through this program?

   ____ Yes

   ____ No

   ____ No opinion

4. Do you encourage employees to take advantage of this program?

   ____ Yes

   ____ No

   ____ Probably will in the future

   ____ Not likely to in the future

5. In your company, what is the opportunity of job advancement for the graduate of this program, allowing him to further utilize his skills?

_____ Excellent

_____ Good

_____ Poor

_____ None

6. What skills are most important in hiring an entry level Data Processing employee? _____

_____

7. What were the strong areas of this employee/graduate?

_____

8. What areas could use improvement? _____

_____

9. How could these areas be improved? _____

_____

10. Would you hire other graduates of the program? _____

11. We would appreciate any comments you have concerning this program.

_____

_____

Tabulation of Interview Response

Graduates N=31

1. What is your present job title?
   - 2 Computer Operator
   - 8 Programmer
   - 5 Jr. Trainee Programmer
   - 16 Other:
     - 6 Program Analyst
     - 2 Sr. Programmer
     - 1 Sr. Computer Application Technician
     - 1 Systems Programmer
     - 1 Project Leader
     - 1 Operations System Librarian
     - 1 System and Procedures Analyst
     - 1 System Analyst
     - 1 Manager of Office Procedures and Systems
     - 1 Computer Applications Technician-Software

2. What was your first job after graduation?
   - 11 Programmer
   - 5 Jr. Programmer
   - 5 Computer Operator
   - 2 Computer Applications Technician
   - 2 Programmer Trainee
   - 1 Computer Programmer
   - 1 Control Clerk
   - 1 Tape Librarian
   - 1 Operator/ Programmer
   - 1 Keypuncher/Computer Operator
   - 1 Project Leader (had prior experience)

3. Was your degree necessary in obtaining your present job?
   - 21 Yes
   - 5 No
   - 5 Don't know

4. What is your opportunity to advance on the job, to further utilize your training?
   - 3 Excellent
   - 24 Good
   - 1 Poor
   - 3 None

5. Are employees encouraged to take advantage of Vocational Technical education?
   - 24 Yes
   - 7 No

6. What skills do you feel were most important in obtaining your first job in Data Processing?

13	Programming	2	Technical competency
7	COBOL	2	Flow charting
6	Computer Operations	2	Hands-on experience
4	Languages	1	Coding
3	Basic Concepts	1	Attitude
3	Accounting	1	JCL
3	Assembler	1	Number System
3	Logic	1	Testing

7. Which three areas did you find to be most helpful in this program?

30	Instructors
15	Equipment
21	Textbooks
3	Field trips to local industry
0	Films
11	Handouts
2	Other audio-visual materials
2	Other:
1	Manuals
1	Assignment

8. Which three areas could be improved?

2	Instructors
8	Equipment
9	Textbooks
2	Fieldtrips to local industry
6	Films
4	Handouts
7	Other audio-visual materials
11	Other:
5	Laboratory time
1	Curriculum
1	Industry
1	JCL
1	Technical Literature
1	Languages
1	Standard Operation
1	Trial and Error

9. How do you feel the above three areas could be improved?

Textbooks:

- Should be easier to understand (2)
- Are aimed at people that have a better understanding of subjects than beginners do
- Should be less technical, be more application oriented
- Should be more up to date
- Should be more comprehensive

Equipment:
- Should change to IBM (2)
- Need more operating time
- Faster turn around time for equipment
- Need a large computer or better operating schedule
- Should use same equipment industry is using
- JCL should be stressed
- Should use and teach some mini-computer
- Teach the concepts of a package rather than a specific vendor's package

Other Audio-Visual:
- Use to cover more difficult areas
- Use to help convey ideas and alternative methods of handling a problem
- Need more audio-visuals
- Should use more package
- Greater use of cassettes to reinforce rather than teach basic concepts
- Use audio-visual for coding techniques that textbooks don't show

Films:
- More education films (2)
- Use to cover more difficult areas
- Use to show available equipment
- Need more films
- Should be used to cover general topics

Handouts:
- Need examples of programs from industry
- Are out-dated, should be kept current
- Need handouts on errors, why and how to correct

Instructors:
- Are too willing to help students, should stress more use of manuals
- Some instructors get off the subject and stress their own ideas too much

Other:
- Laboratory - Need more lab time (5)
- Field Trips - Have more field trips (2)
- Curriculum - Should be on current concepts
- Industry - Need a closer relationship in the industry
- JCL - More time on JCL, have students set up their own JCL
- Technical Literature - Should have technical literature available and use for discussions
- Languages - Need OS language, stress more JCL
- Standard Operations - There should be a course on standard operations
- Trial and Error - Instructor should hand out assignment and let the student write and run their own programs with less instructor assistance

10. Are there any areas you were not trained for which you feel should be included in the program? What are they?

4	JCL	1	Interactive programming
4	Structured Programming	1	Disk parts
4	Data base system	1	RJE
3	Systems development	1	COBOL
3	Software	1	BAL for IBM
2	Hands-on experience	1	Technical systems work
2	CRT	1	Human relations
2	Operation	1	OS
2	Manufacturing areas	1	Desk debugging
2	Data Communications	1	File set up
1	Internship program	1	Concepts on all types of machines
1	Advanced post-graduation classes	1	Accounting

11. We would appreciate any comments you may have concerning this program:

18	Good overall program
9	Hands-on experience is important
6	Structured programming techniques are important
3	Accounting courses are very helpful
2	Assembler programming should be stressed
1	Program fills a real need
1	General education courses should be more flexible
1	Need more statistics courses
1	Instructors should have a more practical background
1	Instructors are very helpful
1	Should be a $2\frac{1}{2}$ year program
1	Need more on JCL for IBM
1	RPG courses are helpful
1	Are using some modular programs
1	Need more on languages and programming
1	Less on concepts and theory
1	Individualized studies were very helpful
1	Office management course was irrelevant
1	More background in business situations
1	Stress communication skills
1	Grades are very important
1	Employers want experienced programmers

Tabulation of Interview Response

Employers N=32

1. What position does the graduate of this program hold in your company?
   - 2 Computer Operator
   - 13 Programmer
   - 5 Jr. Trainee Programmer
   - 12 Other:
     - 5 Programmer Analyst
     - 1 Sr. Programmer
     - 1 Sr. Computer Applications Technician
     - 1 System Programmer
     - 1 Project Analyst
     - 1 Project Leader
     - 1 Assistant Manager of Operations
     - 1 Computer Technician

2. To what extent was the degree a factor in hiring the individual for the position?
   - 7 Required
   - 16 Helpful but not required
   - 3 Prefer actual work experience
   - 2 Prefer to train ourselves
   - 4 Not needed at all

3. In your company, is there a need for the skills the student acquires through this program?
   - 32 Yes
   - 0 No
   - 0 No Opinion

4. Do you encourage employees to take advantage of this program?
   - 24 Yes
   - 6 No
   - 1 Probably will in the future
   - 1 Not likely to in the future

5. In your company, what is the opportunity of job advancement for the graduate of this program, allowing him to further utilize his skills?
   - 7 Excellent
   - 22 Good
   - 1 Poor
   - 2 None

6. What skills are most important in hiring an entry level data processing employee?
   - 15 COBOL
   - 9 Logic
   - 8 Programming
   - 6 Languages
   - 6 Assemblar
   - 5 Attitude
   - 5 Communications
   - 3 Flow charting
   - 2 Computer Operations
   - 2 Basic Concepts
   - 2 Technical competency
   - 2 Coding
   - 2 FORTRAN
   - 1 Accounting
   - 1 Testing
   - 1 Debugging
   - 1 BASIC
   - 1 Math
   - 1 RPG
   - 1 PLI

7. What were the strong areas of this employee/graduate?

10 COBOL
9 Basic understanding of programming
5 Assembler
3 Good knowledge of data processing
3 Operations
3 Motivation
3 Willingness to learn
2 Ability to work alone
2 Communications
2 Ability to follow instructions
2 Logic ability
2 Attitude
2 OSL Job Control
2 Accounting
1 Outstanding in all areas
1 Knowledge of languages
1 Technical knowledge
1 Initiative
1 Good attendance
1 Quick
1 Creativity
1 Ability to get along with co-workers
1 Knowledge of applications and language
1 Self confidence

8. What areas could use improvement?

4 JCL
4 Documentation
4 Communication
2 DOS
2 Relationship of business and data processing concepts
2 BAL
1 CRT
1 Needs to pay attention to instructions
1 Doesn't look for enough ahead for problems
1 Technical areas of operations
1 Usage of standard type utility programs
1 OS
1 Computer time management
1 Opranization skills
1 Structured programming
1 Flowchart
1 Vendor's equipment
1 Efficient programs
1 Use of significant names

9. How could these areas be improved?

12 More emphasis in school
2 Need more experience
1 Have and use CRT equipment
1 Offer a Business Concepts course
1 Possibly by an intern program
1 Cover other types of JCL and utilities
14 No answer

10. Would you hire other graduates of the program?

29 Yes
1 No, company policy to hire only 4 year graduates
2 Prefer experience

11. We would appreciate any comments you may have concerning this program:

19	Hands on experience is helpful
16	Structured programming is very important
5	JCL is important
4	Satisfied with the training the employee received
4	Structured programming unimportant at this time
3	Do not need hands on experience
3	System design is important
3	Need more communication skills
3	Need more operations
3	General business background is helpful
2	Data base systems should be taught
2	Modular programming is important
2	Need more on logic
1	Should stress total job picture
1	Need intricate programming
1	Operator instructions are important
1	File layouts, print out layouts, are important
1	Need technical writing
1	College or technical training is desirable
1	IMS and CICS should be taught
1	Assembler for IBM
1	Internship would be helpful
1	Need more insurance background
1	Need more COBOL
1	Exposure to more languages
1	Data Processing supply is lower than demand
1	Exposure to different print forms
1	Need good basic understanding of programming
1	Accounting courses are helpful

Appendix D

Competency Ranks

Competency		Rank	Mean[1] S.D.[2]	Rank	Mean S.D.	Rank	Mean S.D.	Rank	Mean S.D.
4.04 Correct logical errors	Graduate	1	4.39 0.80	6	4.45 0.79	4	4.01 0.76	2	3.95 0.92
	Employer	3	4.25 0.77	5	4.63 0.64	7	3.53 0.89	3	3.82 0.86
	Instructor	4.5	4.58 0.67	2.5	4.83 0.58	8	4.33 1.07	2	4.45 0.93
4.01 Read a program listing	Graduate	2	4.37 0.79	1	4.85 0.49	1	4.20 0.74	1	3.95 0.91
	Employer	1	4.31 0.77	1	4.92 0.31	2	3.82 0.80	6	3.76 0.83
	Instructor	1.5	4.67 0.65	3.5	4.83 0.58	5	4.42 0.90	2	4.41 0.85
4.03 Correct syntax (clerical) errors	Graduate	3	4.15 0.91	2	4.52 0.80	3	4.16 0.76	18.5	3.61 0.91
	Employer	4	4.13 0.91	4	4.67 0.67	3	3.81 0.74	19	3.53 0.91
	Instructor	8	4.42 0.79	6	4.75 0.62	5	4.42 0.79	20.5	4.00 1.00
4.02 Desk check a program	Graduate	4	4.14 0.93	4	4.50 0.80	5	3.98 0.85	3	3.91 0.91
	Employer	2	4.27 0.80	2	4.82 0.38	5	3.62 0.99	2	3.88 0.83
	Instructor	4.5	4.58 0.67	2.5	4.83 0.58	8	4.33 0.89	11.5	4.12 0.99
6.06 Use job control language (Control Cards)	Graduate	5	4.09 0.96	5	4.47 1.16	6	3.91 0.96	4	3.86 1.02
	Employer	10	3.85 1.08	6	4.39 1.25	6	3.54 1.04	18	3.53 1.02
	Instructor	14.5	4.25 0.87	10	4.50 0.80	14	4.17 0.94	20.5	4.00 1.00

[1] Some items may appear to have the same mean and different ranks due to rounding the mean to two decimal places after ranking.

[2] S.D. = Standard Deviation. A low standard deviation indicates a high degree of consistency in response.

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
4.09 Test program using test data	Graduate	6	4.06 0.83	10	4.03 0.92	9	3.88 0.75	5	3.87 0.87
	Employer	5	4.09 0.91	7	4.38 0.82	4	3.64 0.86	7	3.75 0.82
	Instructor	4.5	4.58 0.67	6	4.75 0.62	8	4.33 0.89	5	4.36 0.92
3.02 Write higher level language instructions	Graduate	7	4.00 0.95	13	3.84 1.54	12	3.76 0.93	9	3.78 0.99
	Employer	7	3.92 1.10	12	3.95 1.63	11	3.44 0.96	5	3.78 0.98
	Instructor	4.5	4.58 0.79	8.5	4.58 0.79	1.5	4.58 0.79	7	4.27 0.90
3.26 Use coding sheets	Graduate	8	3.97 1.11	3	4.51 1.02	2	4.20 0.83	33	3.51 0.97
	Employer	8	3.91 1.04	3	4.76 0.68	1	4.01 0.80	39	3.32 0.81
	Instructor	8	4.42 0.79	2.5	4.83 0.58	1.5	4.58 0.67	26.5	3.91 1.14
4.10 Test program using live (user) data	Graduate	9	3.96 0.98	16	3.64 1.10	14	3.75 0.82	15.5	3.69 0.93
	Employer	6	3.97 1.05	15	3.72 1.13	15	3.41 0.97	12	3.66 0.93
	Instructor	16.5	4.17 1.03	26	3.67 1.07	20.5	4.00 1.13	15.5	4.09 1.14
6.03 Perform program maintenance	Graduate	10	3.90 0.88	11	3.95 1.07	17	3.73 0.83	12	3.75 0.86
	Employer	12	3.80 0.91	10	4.00 1.02	14	3.41 0.78	16	3.62 0.78
	Instructor	28.5	3.91 0.94	26	3.67 1.37	26	3.82 0.87	36.5	3.80 1.03

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
2.08 Prepare a test data for programs	Graduate	11	3.83 1.02	18	3.53 1.11	20	3.69 0.84	10	3.77 0.94
	Employer	9	3.91 1.02	13	3.80 1.07	18	3.38 0.84	1	3.85 0.85
	Instructor	10.5	4.36 0.67	28	3.58 1.24	10.5	4.18 0.87	14	4.10 0.99
1.05 Work with other programmers on problems	Graduate	12	3.77 0.87	8	4.11 1.08	19	3.70 0.81	15.5	3.69 0.88
	Employer	13	3.69 0.91	9	4.10 1.18	8	3.46 0.76	9.5	3.68 0.72
	Instructor	36	3.75 0.97	23	3.75 1.06	50	3.42 1.00	49	3.45 0.93
5.02 Write computer operator instructions	Graduate	13	3.75 0.96	32	3.10 1.24	30	3.58 0.89	7	3.81 0.87
	Employer	15	3.66 1.03	24.5	3.41 1.25	38	3.10 0.97	17	3.59 0.91
	Instructor	24	4.00 1.18	40	3.25 1.29	31.5	3.73 1.27	39.5	3.70 1.25
4.07 Read a file dump	Graduate	14	3.75 0.95	15	3.72 1.10	18	3.72 0.98	23	3.63 0.86
	Employer	14	3.66 0.97	14	3.77 1.18	21	3.34 0.87	26	3.47 0.82
	Instructor	20	4.08 0.79	20.5	3.83 0.94	20.5	4.00 1.04	20.5	4.00 0.89
3.20 Write comments in program	Graduate	15	3.74 1.08	12	3.93 1.20	7	3.90 0.92	8	3.78 0.97
	Employer	11	3.84 0.99	8	4.17 1.10	13	3.41 0.93	9.5	3.68 0.82
	Instructor	1.5	4.67 0.65	6	4.75 0.62	5	4.42 0.90	2	4.45 0.82

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.22 Write edit routines	Graduate	16	3.73 0.90	21	3.41 1.14	21	3.69 0.86	18.5	3.67 0.95
	Employer	16	3.65 0.83	17	3.64 1.13	20	3.36 0.74	22	3.54 0.72
	Instructor	8	4.42 0.79	15	4.17 0.83	18	4.08 0.90	20.5	4.00 0.89
3.16 Write error routines	Graduate	17	3.72 0.97	17	3.62 1.20	13	3.76 0.79	18.5	3.67 0.87
	Employer	17	3.64 0.77	21.5	3.50 1.24	25	3.29 0.75	23.5	3.52 0.77
	Instructor	12	4.33 0.89	15	4.17 0.94	14	4.17 0.94	11.5	4.18 0.98
4.08 Read a cross-reference listing	Graduate	18	3.72 1.03	14	3.73 1.34	8	3.89 0.97	27	3.56 0.90
	Employer	26	3.45 1.01	20	3.52 1.50	9	3.46 0.85	43	3.21 0.86
	Instructor	31.5	3.83 1.11	23	3.75 1.29	29	3.75 1.29	32.5	3.82 0.87
3.09 Write sequential disk file handling routines	Graduate	19	3.67 0.88	20	3.50 1.26	15	3.75 0.80	32	3.52 0.97
	Employer	21.5	3.53 0.98	24.5	3.41 1.40	10	3.45 0.80	36	3.34 0.81
	Instructor	10.5	4.36 0.67	13	4.25 1.22	3	4.45 0.52	20.5	4.00 1.15
4.06 Read a memory dump	Graduate	20	3.65 1.09	30	3.14 1.29	48	3.33 1.07	28	3.56 0.99
	Employer	35	3.38 1.09	31	3.17 1.44	58	2.85 0.99	46	3.15 1.00
	Instructor	31.5	3.83 0.83	30	3.50 0.90	40	3.58 1.08	26.5	3.91 0.83

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
1.04 Work with systems analyst on problem	Graduate	21	3.64 0.98	19	3.53 1.37	44	3.39 0.90	26	3.56 0.99
	Employer	12	3.63 0.98	11	3.96 1.30	41	3.07 0.97	11	3.67 0.85
	Instructor	52	3.42 0.90	35.5	3.33 1.15	58	3.25 1.14	54.5	3.36 0.92
3.10 Use index-sequential disk file handling routines	Graduate	22.5	3.64 0.90	33	3.06 1.32	34	3.54 0.89	30.5	3.54 1.00
	Employer	21.5	3.53 0.89	28	3.28 1.42	27	3.27 0.95	30	3.42 0.86
	Instructor	14.5	4.25 0.75	20.5	3.83 0.94	14	4.17 0.83	5	4.36 0.81
6.02 Patch computer programs	Graduate	22.5	3.64 1.15	22	3.39 1.48	37	3.49 1.06	36	3.48 1.12
	Employer	45	3.21 1.13	50	2.61 1.61	32	3.23 1.04	55	2.99 1.18
	Instructor	49.5	3.44 1.33	64	2.42 1.31	53.5	3.33 1.41	68	3.00 1.34
5.03 Write documentation updates after a program revision	Graduate	24	3.63 0.96	36	2.98 1.20	38	3.48 0.87	13	3.75 0.90
	Employer	20	3.55 0.95	27	3.29 1.24	43	3.04 0.96	15	3.63 0.87
	Instructor	33	3.82 1.08	35.5	3.33 1.23	31.5	3.73 1.19	29	3.90 1.10
2.09 Select appropriate data names for data	Graduate	25	3.62 0.97	9	4.04 1.13	10	3.83 0.80	34	3.51 0.85
	Employer	46.5	3.21 1.13	19	3.54 1.53	29	3.26 0.96	28	3.45 0.85
	Instructor	20	4.08 1.00	8.5	4.38 0.67	14	4.17 0.83	11.5	4.18 0.87

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.12 Use tape file handling routines	Graduate	26	3.61 1.04	28	3.18 1.49	23	3.68 0.92	41	3.35 1.07
	Employer	33	3.40 0.87	32	3.15 1.43	12	3.42 0.80	52	3.03 0.89
	Instructor	16.5	4.17 0.58	19	4.00 0.74	20.5	4.00 0.74	41.5	3.64 0.81
3.17 Use library routines	Graduate	27	3.60 1.10	27	3.21 1.49	27	3.62 0.94	22	3.64 1.05
	Employer	27	3.45 0.99	21.5	3.50 1.41	24	3.31 0.81	27	3.47 0.90
	Instructor	42	3.67 0.98	35.5	3.33 1.15	45	3.50 1.09	26.5	3.91 0.94
3.05 Use disk sort utility routines	Graduate	28	3.57 1.02	23	3.38 1.30	11	3.77 0.86	24	3.62 0.93
	Employer	32	3.40 0.91	16	3.65 1.25	19	3.38 0.83	37	3.34 0.80
	Instructor	36	3.75 0.97	40	3.25 0.62	34	3.67 0.89	32.5	3.82 0.87
3.15 Write subroutines	Graduate	29	3.57 1.00	39	2.96 1.44	33	3.56 0.98	25	3.61 0.94
	Employer	29	3.41 0.89	36	2.89 1.37	39	3.10 0.88	21	3.57 0.89
	Instructor	42	3.67 1.15	33	3.42 1.31	40	3.58 1.16	41.5	3.64 1.03
1.03 Work with users on problem	Graduate	30	3.51 1.06	38	2.97 1.35	52	3.28 0.92	11	3.77 0.94
	Employer	55	3.11 1.22	38.5	2.82 1.40	64	2.71 0.98	20	3.58 1.06
	Instructor	58	3.27 0.90	49.5	2.92 1.24	66	3.00 0.77	56	3.33 0.89

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.11 Use random disk file handling routines	Graduate	31	3.50 0.97	43	2.67 1.34	45	3.38 0.95	30.5	3.54 1.00
	Employer	43	3.25 0.99	51	2.59 1.36	50	2.97 0.96	35	3.36 0.88
	Instructor	44.5	3.64 1.21	49.5	2.92 1.31	42.5	3.55 1.29	43.5	3.60 1.35
5.01 Prepare a program documentation manual	Graduate	32	3.49 1.18	48	2.54 1.28	51	3.30 0.99	18.5	3.67 0.99
	Employer	23	3.48 0.94	42	2.76 1.36	48.5	2.97 0.96	13	3.64 0.99
	Instructor	28.5	3.91 1.22	49.5	2.92 1.24	42.5	3.55 1.21	36.5	3.80 1.23
1.10 Prepare a disk record layout	Graduate	33	3.47 1.03	45	2.58 1.20	26	3.64 0.97	35	3.48 0.90
	Employer	19	3.56 0.96	44	2.71 1.30	34	3.21 0.85	29	3.45 1.05
	Instructor	56.5	3.36 0.81	53.5	2.83 0.94	61.5	3.09 1.04	48	3.50 0.97
3.21 Write instructions for internal/ external controls	Graduate	34	3.46 1.09	42	2.79 1.44	40	3.43 0.91	40	3.41 1.08
	Employer	42	3.30 1.05	37	2.83 1.46	57	2.85 1.02	38	3.33 0.92
	Instructor	42	3.67 1.50	32	3.45 1.81	27	3.78 1.48	45.5	3.56 1.42
3.07 Write table searching instructions	Graduate	35	3.45 0.98	29	3.16 1.17	28	3.60 0.84	37	3.46 0.89
	Employer	25	3.43 0.86	30	3.20 1.29	26	3.29 0.78	31	3.40 0.70
	Instructor	13	4.27 0.65	30	3.50 1.17	10.5	4.18 0.75	9	4.20 0.92

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.14 Use data communications routines	Graduate	36	3.42 1.10	59	2.27 1.42	60	3.20 1.04	14	3.71 1.11
	Employer	53.5	3.11 1.11	62	2.09 1.37	68	2.57 1.11	4	3.81 0.91
	Instructor	49.5	3.44 1.33	67.5	2.25 1.60	53.5	3.33 1.50	11.5	4.18 1.25
2.07 Use structured programming techniques	Graduate	37	3.41 1.03	26	3.24 1.52	35	3.53 0.95	6	3.82 1.08
	Employer	30	3.41 1.22	40	2.81 1.69	46	3.00 0.99	14	3.64 1.18
	Instructor	39.5	3.73 1.10	35.5	3.33 1.56	47.5	3.45 1.21	5	4.36 0.67
3.13 Use card file handling routines	Graduate	38	3.41 1.01	24	3.34 1.29	16	3.75 0.87	61.5	3.00 1.06
	Employer	40	3.33 1.02	26	3.35 1.44	16	3.41 0.77	62	2.78 0.72
	Instructor	36	3.75 0.87	11.5	4.42 0.79	14	4.17 0.72	57.5	3.27 1.19
3.06 Write table building instructions	Graduate	39	3.40 0.97	31	3.13 1.19	29	3.60 0.84	38	3.46 0.90
	Employer	36	3.37 0.94	33	3.06 1.32	31	3.23 0.79	34	3.37 0.71
	Instructor	18	4.10 0.74	40	3.25 1.29	17	4.10 0.74	30	3.89 0.78
2.10 Select file organization & access methods for data files	Graduate	40	3.37 1.08	46	2.58 1.37	56	3.24 1.00	42	3.34 1.01
	Employer	28	3.42 1.03	55	2.35 1.38	56	2.87 1.14	32	3.39 1.03
	Instructor	24	4.00 1.00	57.5	2.75 1.60	24	3.89 0.78	36.5	3.80 1.32

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
1.08 Prepare a printer spacing form	Graduate	41	3.35 0.95	34	3.05 1.09	22	3.69 0.86	43.5	3.34 0.74
	Employer	31	3.41 0.93	35	3.05 1.27	17	3.38 0.86	41	3.27 0.96
	Instructor	36	3.75 0.97	23	3,75 0.62	29	3.75 1.14	32.5	3.82 1.08
1.01 Use company system standards	Graduate	42	3.30 1.08	7	4.13 1.23	46	3.36 0.77	21	3.66 1.01
	Employer	37	3.37 1.08	18	3.61 1.70	53	2.94 0.91	8	3.68 1.15
	Instructor	36	3.75 1.29	15	4.17 1.34	29	3.75 1.36	15.5	4.09 1.14
2.02 Prepare a general (logic) program flowchart	Graduate	43	3.30 1.09	35	3.02 1.12	24	3.67 0.86	39	3.44 0.99
	Employer	24	3.47 0.94	34	3.05 1.27	37	3.12 0.79	44	3.18 0.95
	Instructor	24	4.00 1.04	17.5	4.08 0.90	23	3.92 1.08	26.5	3.91 1.04
4.12 Recommend corrections or modifications to programs	Graduate	44	3.24 1.03	40	2.94 1.21	50	3.31 0.92	29	3.55 0.92
	Employer	44	3.24 0.98	29	3.25 1.20	45	3.01 0.95	23.5	3.52 0.78
	Instructor	39.5	3.73 1.01	44.5	3.08 1.31	36	3.64 1.03	20.5	4.00 1.05
6.08 Perform number system arithmetic	Graduate	45	3.20 1.17	41	2.85 1.60	39	3.45 0.99	55	3.11 1.08
	Employer	58	3.04 1.10	43	2.75 1.62	35	3.13 1.06	61	2.79 0.99
	Instructor	62	3.20 1.03	62	2.55 1.04	45	3.50 1.08	51.5	3.40 0.97

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
1.09 Prepare a tape record layout	Graduate	46	3.19 1.05	60	2.26 1.18	36	3.49 0.96	52	3.18 0.91
	Employer	34	3.38 1.05	58	2.30 1.26	33	3.22 0.86	54	2.99 1.07
	Instructor	56.5	3.36 0.81	53.5	2.83 0.94	61.5	3.09 1.04	51.5	3.40 1.07
2.11 Select appropriate programming language for problem	Graduate	47	3.18 1.26	68	1.84 1.34	47	3.36 1.24	67	2.78 1.22
	Employer	64	2.73 1.23	69	1.62 1.20	61	2.79 1.26	66	2.68 1.14
	Instructor	51	3.43 1.27	72.5	1.83 1.34	49	3.43 1.27	57.5	3.27 1.49
5.04 Summarize the controls in program to detect errors	Graduate	48	3.17 1.08	54	2.34 1.31	54	3.26 0.91	47	3.33 1.02
	Employer	39	3.34 0.97	41	2.79 1.25	48.5	2.97 0.87	25	3.49 0.87
	Instructor	54	3.40 1.35	46.5	3.00 1.41	56.5	3.30 1.42	51.5	3.40 1.35
4.11 Edit program for effective use of auxiliary storage	Graduate	49	3.16 1.13	62	2.20 1.30	59	3.20 1.00	49	3.29 1.08
	Employer	59	2.96 1.11	59	2.29 1.30	63	2.75 0.99	48	3.12 0.93
	Instructor	24	4.00 0.76	56	2.82 1.54	37	3.63 1.06	8	4.22 0.83
2.01 Use standard flowchart symbols	Graduate	50	3.15 1.11	25	3.25 1.22	25	3.65 0.87	50	3.27 0.93
	Employer	46.5	3.21 1.04	23	3.42 1.42	23	3.32 0.87	51	3.08 0.92
	Instructor	27	3.92 1.31	11.5	4.42 0.79	25	3.83 1.34	20.5	4.00 0.89

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.04 Use tape sort utility routines	Graduate	51	3.14 1.16	56	2.31 1.40	42	3.43 1.01	58	3.05 1.14
	Employer	57	3.08 0.99	53.5	2.47 1.50	36	3.12 0.88	64	2.76 1.05
	Instructor	67	3.00 1.13	49.5	2.92 0.90	64.5	3.08 1.08	68	3.00 1.10
4.05 Read a trace	Graduate	52	3.12 1.08	58	2.30 1.20	55	3.25 0.97	57	3.09 0.99
	Employer	51	3.13 1.08	46	2.69 1.35	55	2.89 0.94	50	3.09 0.93
	Instructor	24	4.00 0.85	26	3.67 0.98	34	3.67 1.07	20.5	4.00 0.89
1.07 Prepare a card record layout	Graduate	53	3.11 1.06	50	2.47 1.07	31	3.56 0.98	59	3.02 0.98
	Employer	49	3.13 1.19	52	2.57 1.34	22	3.33 0.91	59	2.89 1.03
	Instructor	63	3.17 0.72	40	3.25 0.62	53.5	3.33 0.78	62	3.18 0.87
6.05 Operate computer for program tests	Graduate	54	3.11 1.25	37	2.98 1.62	41	3.43 1.25	65	2.83 1.21
	Employer	62	2.93 1.17	38.5	2.82 1.68	30	3.23 1.24	65	2.74 1.01
	Instructor	69	2.91 1.14	40	3.25 1.36	61.5	3.09 1.04	70	2.90 1.29
2.06 Divide a program into modules	Graduate	55	3.10 1.12	57	2.30 1.19	62	3.20 0.94	45	3.34 1.22
	Employer	48	3.15 1.08	53.5	2.47 1.38	52	2.94 0.96	40	3.27 1.13
	Instructor	44.5	3.64 0.67	43	3.17 1.03	47.5	3.45 0.93	43.5	3.60 0.97

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
5.05 Summarize calculations used in program	Graduate	56	3.10 1.04	61	2.25 1.23	53	3.26 0.92	51	3.20 0.96
	Employer	38	3.35 0.90	47	2.68 1.33	51	2.95 0.73	33	3.39 0.94
	Instructor	54	3.40 1.35	46.5	3.00 1.41	56.5	3.30 1.42	51.5	3.40 1.35
2.03 Prepare a detail program flowchart	Graduate	57	3.10 1.14	49	2.48 1.23	32	3.56 0.90	54	3.13 1.06
	Employer	41	3.33 1.05	48	2.66 1.35	42	3.07 0.77	53	3.00 1.04
	Instructor	47.5	3.50 1.31	30	3.50 1.00	40	3.58 1.16	47	3.55 1.37
6.09 Convert numbers between number systems	Graduate	58	3.09 1.23	47	2.57 1.48	43	3.40 1.00	61.5	3.00 1.18
	Employer	53.5	3.11 1.16	49	2.61 1.57	40	3.09 1.04	63	2.76 1.02
	Instructor	65	3.10 1.29	67.5	2.25 1.22	34	3.67 1.12	68	3.00 1.26
6.07 Use virtual storage techniques	Graduate	59	3.09 1.27	53	2.39 1.65	64	3.17 1.22	46	3.33 1.29
	Employer	60	2.96 1.00	56	2.34 1.58	60	2.80 1.13	47	3.13 1.29
	Instructor	46	3.55 1.29	59.5	2.67 1.61	61.5	3.09 1.51	39.5	3.70 1.34
3.19 Use macros	Graduate	60	3.07 1.10	52	2.41 1.52	58	3.21 1.17	56	3.09 1.11
	Employer	56	3.08 1.22	57	2.33 1.50	54	2.89 1.02	56	2.99 1.02
	Instructor	20	4.08 0.90	17.5	4.08 0.90	20.5	4.00 0.95	32.5	3.82 0.98

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.23 Write check digit checking routines	Graduate	66	2.87 1.11	66	1.89 1.10	63	3.17 1.08	64	2.89 1.02
	Employer	68	2.54 0.97	68	1.66 1.02	69	2.56 0.79	67	2.67 1.00
	Instructor	59	3.25 1.29	53.5	2.83 1.40	64.5	3.08 1.16	62	3.18 1.33
3.24 Write check point-restart instructions	Graduate	67	2.84 1.15	69	1.74 1.05	70	2.96 1.18	63	2.95 1.06
	Employer	67	2.59 1.07	70.5	1.60 0.98	74	2.39 0.95	57	2.96 1.13
	Instructor	67	3.00 1.33	65	2.33 1.44	69	2.80 1.40	62	3.18 1.17
3.03 Write report program generator language instructions	Graduate	68	2.84 1.31	63	2.04 1.56	66	3.13 1.17	69	2.61 1.28
	Employer	50	3.13 1.39	60	2.26 1.56	47	2.98 1.06	58	2.94 1.20
	Instructor	30	3.90 0.88	44.5	3.08 1.51	38	3.60 1.26	36.5	3.80 0.79
3.25 Write form test pattern routine	Graduate	69	2.66 1.01	70	1.73 1.09	68	3.03 1.02	68	2.68 0.98
	Employer	71	2.30 1.05	73	1.46 0.75	71	2.55 0.97	70	2.56 1.01
	Instructor	67	3.00 1.31	66	2.27 1.35	68	2.88 1.46	64.5	3.11 1.27
6.01 Keypunch program	Graduate	70	2.52 1.02	44	2.59 1.30	49	3.33 1.12	72	2.40 1.00
	Employer	73	2.23 0.99	45	2.70 1.38	28	3.26 1.07	72	2 0
	Instructor	72	2.55 1.13	53.5	2.83 1.59	70	2.73 1.42	73	2. 1.25

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
3.01 Write assembler language instructions	Graduate	61	3.04 1.18	65	2.01 1.48	65	3.14 1.18	66	2.82 1.16
	Employer	66	2.70 1.46	65	1.96 1.43	62	2.79 1.12	69	2.60 1.23
	Instructor	47.5	3.50 1.08	59.5	2.67 1.50	51	3.40 1.07	54.5	3.36 1.21
1.02 Write a detailed description of a problem	Graduate	62	3.03 1.13	51	2.42 1.30	69	3.02 0.89	48	3.31 1.05
	Employer	61	2.94 1.02	63.5	2.07 1.19	70	2.55 0.75	42	3.22 1.26
	Instructor	60.5	3.22 0.67	61	2.58 1.31	53.5	3.33 0.50	60	3.20 1.03
3.08 Write table sorting instructions	Graduate	63	2.94 1.07	64	2.02 1.16	61	3.20 0.99	60	3.01 0.95
	Employer	65	2.73 0.96	63.5	2.07 1.19	59	2.84 0.87	60	2.89 0.90
	Instructor	54	3.40 0.97	57.5	2.75 1.14	45	3.50 0.85	59	3.22 0.83
1.06 Prepare a system flowchart	Graduate	64	2.94 1.06	55	2.32 1.15	57	3.21 1.05	43.5	3.34 0.99
	Employer	52	3.12 1.05	61	2.17 1.29	44	3.04 0.87	45	3.17 1.06
	Instructor	64	3.11 0.78	63	2.50 1.17	59	3.22 1.09	66	3.10 1.10
3.18 Write library routines	Graduate	65	2.90 1.07	67	1.84 1.16	67	3.10 1.03	53	3.16 1.04
	Employer	63	2.75 1.04	66	1.92 1.21	65	2.67 1.10	49	3.10 0.99
	Instructor	60.5	3.22 1.39	69	2.17 1.47	67	2.89 1.45	45.5	3.56 1.33

Competency		Importance Rank	Importance Mean S.D.	Frequency Rank	Frequency Mean S.D.	Performance Rank	Performance Mean S.D.	Future Need Rank	Future Need Mean S.D.
2.05 Prepare a decision table	Graduate	71	2.45 0.99	71	1.58 0.91	71	2.83 1.01	71	2.55 1.05
	Employer	70	2.32 0.99	67	1.70 0.95	72	2.52 0.85	68	2.61 1.05
	Instructor	73	2.25 1.04	72.5	1.83 0.94	71	2.63 1.06	72	2.45 1.13
6.04 Convert a program to another language	Graduate	72	2.37 1.08	72	1.56 0.83	72	2.76 1.08	70	2.61 1.11
	Employer	69	2.32 0.97	72	1.47 0.80	66	2.60 1.06	73	2.41 1.14
	Instructor	70	2.78 1.09	70	2.09 0.83	73	2.44 0.88	64.5	3.11 1.36
6.10 Prepare printer carriage tape	Graduate	73	2.24 0.95	73	1.53 0.66	73	2.74 1.21	73	2.30 1.05
	Employer	72	2.28 0.85	70.5	1.60 0.79	67	2.57 1.06	71	2.49 0.96
	Instructor	71	2.60 1.07	71	2.00 0.85	72	2.50 0.85	71	2.60 0.84
2.04 Prepare a grid chart	Graduate	74	1.86 0.89	74	1.28 0.68	74	2.37 1.02	74	2.08 0.97
	Employer	74	2.06 0.85	74	1.45 0.74	73	2.50 0.86	74	2.28 1.00
	Instructor	74	2.00 0.82	75	1.58 0.79	75	2.29 1.11	74	2.09 0.94
1.11 Prepare a paper tape record layout	Graduate	75	1.73 1.05	75	1.12 0.43	75	2.00 1.21	75	1.77 1.04
	Employer	75	2.00 1.17	75	1.34 0.84	75	2.39 1.16	75	1.93 1.11
	Instructor	75	1.88 0.83	74	1.67 0.98	74	2.38 1.19	75	1.82 0.87

Data Processing Graduates
General Education and Learning Experiences

Competency	Emphasis Rank	Mean S.D.
Effective Speaking (Speech)	1	3.73 0.86
Field Trips	2	3.56 0.95
Communications Skills (English)	3	3.48 0.89
Statistics	4	3.47 0.85
Office Management	5	3.47 0.96
Psychology of Human Relations	6	3.36 0.95
Accounting	7	3.34 0.88
State Competitive Data Processing Exams	8	3.26 0.10
Student Data Processing Clubs	9	3.26 0.84
Economics	10	2.96 0.75
American Institutions (Government)	11	2.44 0.77

Appendix E

Rank Correlations

Rank Correlations

	Graduate	Employer	Instructor
Importance/Frequency	0.89	0.89	0.85
Importance/Performance	0.86	0.80	0.94
Importance/Future Need	0.90	0.83	0.88
Performance/Frequency	0.90	0.86	0.85
Performance/Future Need	0.69	0.50	0.80
Frequency/Future Need	0.80	0.75	0.73

	Importance	Frequency	Performance	Future Need
Graduate/Employer	0.92	0.96	0.94	0.94
Employer/Instructor	0.79	0.85	0.79	0.75
Graduate/Instructor	0.82	0.88	0.73	0.74

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